U.S. DEPARTMENT OF COMMERCE
National Technical Information Service

PB-256 936

Water Quality and Waste Source Investigations Missouri River and Papillion Creek, Omaha, Nebraska

National Field Investigations Center

March 1973

PB 256 936

002149 246117

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U. S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

BIBLIOGRAPHIC DATA SHEET	1. Report No.	2.	3. Recipient's Accession No. PB-256 936

4. Title and Subtitle

Water Quality and Waste Source Investigations
Missouri River and Papillion Creek, Omaha, Nebraska.

5. Report Date
March 1973

6.

7. Author(s)

8. Performing Organization Rept. No.

9. Performing Organization Name and Address

National Field Investigations Center
Denver, Colorado

10. Project/Task/Work Unit No.

11. Contract/Grant No.

12. Sponsoring Organization Name and Address

13. Type of Report & Period Covered

14.

15. Supplementary Notes
Prepared in cooperation with
Environmental Protection Agency, Kansas City, Mo. Region VII.

16. Abstracts

The Environmental Protection Agency, Region VII, requested water-quality investigations in the Missouri River Basin (Omaha Area). These studies, conducted during the period of 30 July to 12 August 1972, included an evaluation of municipal and industrial wastewater treatment facilities and limited stream surveys on the Missouri River and Papillion Creek to determine the impact of waste loads on the quality of the receiving waters.

17. Key Words and Document Analysis. 17a. Descriptors

*Water quality management
*Water pollution abatement
*Missouri River
*Papillion Creek
Surveys
Municipalities
Industries
Sewers
Diverting
Sewage treatment
Industrial waste treatment
Sewage
Industrial wastes
Law enforcement
Nebraska
Iowa
Kansas
Missouri

17b. Identifiers/Open-Ended Terms

Water quality data
Omaha(Nebraska)

17c. COSATI Field Group 13B

18. Availability Statement National Technical Information Service Springfield, VA 22161	19. Security Class (This Report) UNCLASSIFIED	21. No. of Pages 241
	20. Security Class (This Page UNCLASSIFIED	22. Price PC$8.00 MF$2.25

ORM NTIS-35 (REV. 10-73) ENDORSED BY ANSI AND UNESCO. THIS FORM MAY BE REPRODUCED USCOMM-DC 8265-P74

ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF ENFORCEMENT

Report on

WATER-QUALITY AND WASTE-SOURCE INVESTIGATIONS MISSOURI RIVER AND PAPILLION CREEK OMAHA, NEBRASKA

National Field Investigations Center-Denver
Denver, Colorado
and
Region VII, Kansas City, Missouri

March 1973

TABLE OF CONTENTS

Page

LIST OF APPENDICES iv

LIST OF FIGURES v

LIST OF TABLES vi

GLOSSARY OF TERMS vii

I. INTRODUCTION 1
  A. BACKGROUND 1
  B. WATER QUALITY INVESTIGATIONS 1972 4

II. SUMMARY AND CONCLUSIONS 7

III. RECOMMENDATIONS 15

IV. DESCRIPTION OF THE AREA 19

V. WASTE SOURCES 23
  A. MUNICIPAL 26
    Missouri River Wastewater Treatment Plant . . 26
    Papillion Creek Wastewater Treatment Plant. . 32
  B. INDUSTRIAL 33
    Allied Chemical Corporation -
      Agricultural Division 33
    Central Wastewater Pretreatment Facility . . . 35
    Flinn Paving Company Asphalt Plant 37
    National By-Products, Inc. 38
    The Quaker Oats Company 40
    Union Pacific Shops 41
  C. SEWERAGE SYSTEM 42
    Diversion Structures 46
    Grit Removal Facilities 47
      Monroe Street, South Omaha, and
      Minne Lusa Facilities 47
      Missouri Avenue, Riverview Park,
      Farnam Street, and Burt Izard Facilities . . 48
      Hickory Street, Pierce Street,
      Leavenworth Street, Jones Street,
      and Bridge Street Facilities 50
    Lift Stations 51

TABLE OF CONTENTS (Cont.)

Page

VI. STREAM SURVEYS 55
  A. LITTLE PAPILLION CREEK 55
  B. BIG PAPILLION CREEK 60
  C. PAPILLION CREEK 60
  D. MISSOURI RIVER 62

VII. STATUS OF WATER POLLUTION ABATEMENT 65
  A. PAST AND PRESENT ABATEMENT ACTIONS 65
  B. POLLUTION CONTROL REQUIREMENTS OF THE FWPCA AMENDMENTS OF 1972 70

VIII. REFERENCES 75

APPENDICES

A EXCERPTS FROM NEBRASKA WATER QUALITY STANDARDS

B MUNICIPAL WASTEWATER TREATMENT PLANT REPORTS

C INDUSTRIAL PLANT REPORTS

D STUDY METHODS

E CHAIN OF CUSTODY PROCEDURES

F EFFLUENT LIMITATIONS AND PRETREATMENT REQUIREMENTS

G COMMERCIAL AND INDUSTRIAL USE OF PUBLIC SEWERS AND DRAINS
  OMAHA INDUSTRIAL WASTE ORDINANCE
  RULES AND REGULATIONS, MAY 1965

H INTERIM UPGRADING TREATMENT MEASURES FOR
  MISSOURI RIVER WASTEWATER TREATMENT PLANT
  EXISTING PAPILLION CREEK WASTEWATER TREATMENT PLANT
  CENTRAL WASTEWATER PRETREATMENT FACILITY

LIST OF FIGURES

Figure No.		Follows Page
1	Location Map-Missouri River, Omaha, Nebraska	20
2	Sampling Locations-Omaha, Nebraska Area	24
3	Sampling Locations-South of Omaha, Nebraska Area	24
4	Sewage Collection for the Missouri River Wastewater Treatment Plant, Omaha, Nebraska 1972	42

LIST OF TABLES

Table No.		Page
1	MAJOR MUNICIPAL AND INDUSTRIAL SOURCES-MISSOURI RIVER, OMAHA, NEBRASKA, JULY-AUGUST 1972	24
2	MINOR MUNICIPAL WASTEWATER TREATMENT FACILITIES IN THE PAPILLION CREEK WATERSHED	25
3	SUMMARY OF ANALYTICAL DATA FOR MUNICIPAL AND INDUSTRIAL WASTE-SOURCE EVALUATIONS, MISSOURI RIVER-OMAHA, NEBRASKA AREA JULY-AUGUST 1972	27
4	SUMMARY OF BACTERIOLOGICAL ANALYSES OF MUNICIPAL AND INDUSTRIAL WASTE DISCHARGES, OMAHA, NEBRASKA, JULY-AUGUST 1972	30
5	SERVICE AREAS IN OMAHA, NEBRASKA	43
6	LIFT STATIONS AND GRIT-REMOVAL FACILITIES, MISSOURI RIVER WASTEWATER TREATMENT PLANT SERVICE AREA, OMAHA, NEBRASKA, AUGUST 1972	44
7	SUMMARY OF FIELD MEASUREMENTS AND ANALYTICAL DATA - LITTLE PAPILLION CREEK, BIG PAPILLION CREEK, PAPILLION CREEK, AND THE MISSOURI RIVER, 31 JULY - 11 AUGUST 1972	56
8	RESULTS OF BACTERIOLOGICAL ANALYSES, MISSOURI RIVER AND PAPILLION CREEK, 31 JULY - 5 AUGUST 1972	58
9	SUMMARY OF HEAVY METAL AND NUTRIENT DATA AT SELECTED STATIONS ON THE MISSOURI RIVER, 7 - 11 AUGUST 1972	59

GLOSSARY OF TERMS

BOD	- Biochemical Oxygen Demand, 5-day
COD	- Chemical Oxygen Demand
DO	- Dissolved Oxygen
MPN	- Most Probable Number
MF	- Membrane Filter
NH_3-N	- Ammonia as Nitrogen
NO_3 + NO_2-N	- Nitrate Nitrite as Nitrogen
RM	- River Mileage (e.g. 367.5/4.0), with the first number denoting distance from mouth of the Missouri River to the confluence with a tributary stream, and second value indicating distance upstream of mouth of the tributary stream.
TOC	- Total Organic Carbon
TKN	- Total Kjeldahl Nitrogen (Ammonia + Organic Nitrogen)
TSS or SS	- Suspended Solids
VSS	- Volatile Suspended Solids
WWTP	- Wastewater Treatment Plant
C	- Centigrade temperature scale
F	- Fahrenheit temperature scale
cfm	- Flow rate given in cubic feet per minute
cfs	- " " " " " " " second
gpd	- " " " " gallons per day
gph	- " " " " gallons per hour
gpm	- " " " " gallons per minute

GLOSSARY OF TERMS (Cont.)

mgd	- Flow rate given in million gallons per day
mg/l	- Concentration given in milligrams per liter
µg/l	- " " " micrograms per liter
µmhos/cm	- Unit of specific conductance (mho--the inverse of the standard unit of electrical resistance, the ohm) measured over a 1-centimeter distance, conventionally at 25°C.
ppm	- Concentration given in parts per million parts

I. INTRODUCTION

A. BACKGROUND

The Surgeon General of the United States Public Health Service, having had reason to believe that pollution of the Missouri River from untreated domestic sewage and industrial waste discharges was endangering the health and welfare of persons in Nebraska, Iowa, Kansas, and Missouri convened an enforcement conference on the matter of pollution of the Missouri River on 14 June 1957.[1]

The Conferees concluded that the major sources of pollution in the Missouri River, from north of Omaha, Nebraska, to St. Joseph, Missouri, were municipal and industrial discharges from Omaha, Nebraska. They also concluded that the effects of this pollution were "(1) deterioration of water quality for public water supply of St. Joseph, Missouri, with associated enhancement of possible disease transmission; (2) increased concentrations of coliform and other organisms associated with human diseases which constitute a health hazard to commercial and recreational uses of the river; (3) deterioration of water quality so as to interfere with its use for stock watering; (4) deterioration of water quality so as to prevent full use of the commercial fishery of the Missouri River below Blair, Nebraska; (5) deterioration of water quality so as to create conditions inimical to fish and wildlife in the area; and (6) impairment of water quality for many industrial uses."

In addition, the Conferees agreed that the bulk of the wastes (i.e., grease, paunch manure, bone, hair, etc.) from the meat-packing industries in South Omaha would be removed by the plants themselves before being discharged into city sewers. As a result, the Conferees recommended that adequate wastewater treatment be provided by the municipalities and industries along the Missouri River as soon as possible and that the construction contract for the last treatment plant in Omaha be awarded by 1 January 1960.

A second session of the enforcement conference was held 21 July 1964[2/] on the basis "... that pollution of the Missouri River, caused by discharges of sewage and industrial wastes from the City of Omaha, was continuing to endanger the health or welfare of persons in States other than in which the discharges originate." The Conferees reluctantly agreed to accept a proposal by Omaha whereby the city would finance and build a treatment plant to treat all packing-house wastes prior to being discharged into the city sewers. This new plant was to be completed and in operation by 15 December 1966. After this date "no wastes are to be discharged to the Missouri River from Omaha without at least primary treatment."

Progress evaluation meetings were held 11 and 12 February 1965,[3/] 27 January and 29 March 1966,[4/] and on 8 March 1967.[5/] During these meetings the Conferees discussed requirements for the effluent from the Central Wastewater Pretreatment Plant. It was recommended that "suspended solids in the Missouri River Sewage Treatment Plant influent should not exceed 400 parts per million" and that the maximum grease to be received in south inlet (i.e., the point where packing-house wastes enter) should not exceed 18,000 lb/day.

The Omaha Public Works director stated, during the 29 March 1966 meeting, that the packing-house wastewater treatment facility "from a technical standpoint...will adequately treat the packing wastes so that subsequent treatment at the Missouri River Sewage Treatment Plant of the wastes will result in the discharge to the Missouri River of a normal primary treatment plant effluent."

Water quality standards were established by the Nebraska Department of Environmental Control and approved as Federal Standards* [Appendix A]. These standards consist of three components: (1) Stream classifications (interstate waters) that designate water uses to be protected; (2) Water quality criteria that specify water quality conditions which must be maintained; and (3) An implementation plan that establishes time schedules for providing adequate wastewater control facilities for all sources of pollution.

The Federal Water Quality Administration (Department of the Interior) Missouri River Basin Region conducted a water-quality survey of the Missouri River, during the fall of 1968 and the winter of 1969,[6/] in order to develop technical support for stringent water quality standards. Results of the study showed a decrease in the water quality of the river downstream from Omaha, as evidenced by an increase in fecal coliform organisms. *Salmonella* were present in the river from Omaha to St. Joseph, Missouri.

---

* The Department of Environmental Control revised these standards on 20 June 1972 but has not received Federal approval.

B. WATER QUALITY INVESTIGATIONS 1972

The Environmental Protection Agency, Region VII, requested the National Field Investigations Center-Denver (NFIC-D), Office of Enforcement, EPA, to conduct water-quality investigations in the Missouri River Basin (Omaha Area). These studies, conducted during the period of 30 July to 12 August 1972, included an evaluation of municipal and industrial wastewater treatment facilities and limited stream surveys on the Missouri River and Papillion Creek to determine the impact of waste loads on the quality of the receiving waters. The primary objectives of the survey were to:

1. Evaluate water pollution control practices for municipal and industrial waste sources and determine compliance or non-compliance with Nebraska Water Quality Standards (i.e., the requirement for a minimum of secondary treatment for all municipal wastes by 31 December 1975, and an equivalent degree of treatment* for all other wastes), and Federal regulations, e.g., Refuse Act and the Federal Water Pollution Control Act, as amended.

2. Evaluate the adequacy of the sewerage system and the water pollution control program proposed by the City of Omaha.

---

* Adequate degree of treatment for an industrial waste is considered to be that treatment which is presently obtainable by installation of the best practicable control technology currently available for a particular industry.

3. Determine progress, in pollution abatement, since the Second Session of the Conference on Pollution of Interstate Waters of the Missouri River, Omaha, Nebraska, Area, June 1967.

4. Determine whether abatement actions are required.

On 18 October 1972 the Federal Water Quality Act Amendments of 1972 were enacted. Elements of this legislation that are relevant to the water quality situation in the Omaha area include requirements for establishment of a State-Federal waste discharge permit system and application of effluent limitations, the promulgation of water-quality standards for intrastate streams, the prohibition of discharges of toxic materials, application of best practicable control technology for treatment of industrial wastewaters, secondary treatment (as defined by EPA) for publicly owned treatment works, and the requirement of pretreatment of industrial wastewaters discharged into publicly owned and operated wastewater collection and treatment system. This report discusses the impact of the 1972 Amendments upon the Omaha situation and recommends the necessary actions to meet the requirements so imposed.

The cooperation provided by representative from City, State, and Federal agencies and from industries in conducting the survey is gratefully acknowledged.

Preceding page blank

II. SUMMARY AND CONCLUSIONS

1. During the survey period (30 July to August 1972) municipal and industrial wastewater sources in the Omaha, Nebraska, area are known to have discharged daily loads of at least 135,000 lb of BOD and 170,000 lb of suspended solids. During this same period a number of lift stations were inoperative, resulting in the by-passing to the Missouri River of at least 14 mgd of raw sewage. These discharges contained an additional 30,000 lb each of BOD and suspended solids.

2. The Missouri River Wastewater Treatment Plant (WWTP) removed an average of 13 percent BOD and 22 percent suspended solids during the period of the survey. These levels of waste removal are low for a primary treatment plant. Removals of 35 percent BOD and up to 50 percent suspended solids are normally expected. The average influent (26.1 mgd) waste strength was high -- 630 mg/l BOD, 835 mg/l suspended solids, and 1,200 mg/l COD, thus indicating the presence of strong industrial wastes. The wastewater received in the north inlet was septic. No disinfection was practiced, and the high fecal-coliform bacterial densities in the effluent sustained the upstream bacterial contamination of the Missouri River. Secondary treatment is to be installed and operative at this plant by 31 December 1975, a date that City of Omaha officials have stated can only be met if adequate (80 percent) funding support is available. Federal grant funds allocated to the State of Nebraska will not be sufficient to provide a full 75 percent Federal funding of the Missouri River WWTP additions before 31 December 1975 (estimated cost of 30 million dollars).

3. The combined sewage system often by-passes wastewater to the Missouri River, primarily from 22 diversion structures and 11 lift stations, due to equipment failure and storm runoff. Equipment failure usually occurs in the grit-removal facility (i.e., bucket elevators, grit conveyors, bearings, and motors). The frequency of by-passing and the amount by-passed from each structure varies. During the survey at least 14 mgd of raw sewage was being by-passed. In 1971 two of the largest lift stations, Leavenworth Street and Burt Izard, by-passed flow 43 and 36 percent of the time, respectively. The Leavenworth facility was inoperative during the entire study period; Burt Izard facility was inoperative for three days. The dry-weather flow from these two facilities is estimated to be 12 and 14 mgd, respectively.

Visual inspection of diversion structures during the survey revealed a buildup of grit within several of the smaller (Spring Street, Harney Street, and Douglas Street) structures, resulting in continuous by-passing of the untreated sewage.

The City of Omaha intends to modify the grit facilities for Leavenworth Street and Burt Izard lift stations by 31 December 1974 if funds are available. Construction grant funds for these facilities will be requested from EPA. However, such funds will not be available until at least FY 1975. There are no formal plans, at this time, for improvements to the remaining grit-removal facilities. Thus, frequent by-passing of substantial quantities of raw sewage to the Missouri River can be expected to continue.

4. Presently, there are no plans to proceed with a general renovation program to replace the deteriorating brick sewers with separate storm and sanitary sewers. In the absence of such a program, maintenance of grit-removal facilities and lift stations will continue to be a difficult problem and cause by-passing of raw sewage, and combined storm and sanitary sewage will continue to be by-passed during wet weather. Operational difficulties resulting from combined wet-weather flows will hamper improved treatment at the Missouri River WWTP.

5. The Quaker Oats Company discharged daily waste loads of at least 21,000 lb of BOD, 10,200 lb of TOC, 4,400 lb of suspended solids, and 900 lb of furfural into the Pierce Street sewer. The discharge (590 mg/l) of suspended solids violates the Omaha Industrial Waste Ordinance and causes operational problems in the grit-removal facility at the Pierce Street Lift Station (i.e., broken grit conveyors and broken bucket elevator). When the grit facility is out of service (18 percent of the time in 1971) the entire flow in the Pierce Street sewer, containing high concentrations (75-110 mg/l) of furfural, is by-passed. The discharge of furfural, a toxic substance, to the river causes localized water-quality degradation. The company is constructing a clarifier that is designed to reduce the suspended-solids concentration to 100 mg/l or less. This reduction of suspended solids in the Pierce Street sewer should decrease operational problems at the Pierce Street Lift Station.

6. The Central Wastewater Pretreatment Facility receives wastewater from 13 packing houses. This facility contributed daily loads of 19,500 lb of grease, 67,200 lb of suspended solids, and 72,600 lb of BOD to the Missouri River WWTP. The suspended-solids concentration (1,130 mg/l) violated the maximum limits (i.e., 400 mg/l) of the Omaha Industrial Waste Ordinance. The oil-and-grease load exceeded the requirement of the Enforcement Conference, that is, the total grease load received at the south inlet of the Missouri River Wastewater Treatment Plant shall not exceed 18,000 lb/day.

7. The Missouri River is degraded by inadequately treated municipal wastes discharged from the Missouri River plant and by the by-passing of raw sewage at upstream lift stations. The log-mean, fecal-coliform bacterial density of 4,100/100 ml immediately upstream of the Missouri River plant (RM 611.87) violated the Nebraska Water Quality Standards. The plant discharge (RM 611.42) increased the log-mean, fecal-coliform bacterial density 14-fold in the river immediately downstream.

8. The Papillion Creek Wastewater Treatment Plant, based on design criteria, is hydraulically (51 percent) and organically (46 percent) overloaded. All wastewater received at least primary treatment, but less than 50 percent (13 mgd) received secondary treatment. During the survey BOD removal ranged from 15 to 23 percent. No disinfection of the effluent was being provided. The City of Omaha has failed to provide secondary treatment and disinfection of wastewater discharged to Palillion Creek by 1 January 1972, as required by the Nebraska Water Quality Standards.

A new secondary treatment plant (total capacity, 70 mgd) is to be constructed and in operation by 31 December 1975. Construction grants have been approved for the first 50-mgd capacity of the plant, with anticipated completion 860 days after the awarding of the grant. (This should meet the 31 December 1975 deadline.) A grant application has been made for the last 20-mgd capacity. However, funds will not be available for this portion of the plant until at least FY 1975.

9. Big Papillion Creek is degraded by the discharge from the Papillion Creek Wastewater Treatment Plant. The DO was reduced from a range of 5.6 to 9.2 mg/l, upstream, to a range of 1.2 to 4.4 mg/l, downstream from the plant discharge. Also, there was a noticeable increase in turbidity and floating solids. Violations of Sections C-3 (turbidity and solids deposits) and C-6 (dissolved oxygen) of the Nebraska Water Quality Standards, were thus evident.

10. Allied Chemical Corporation provides no treatment of wastes discharged to the Missouri River. The range of NH_3-N concentrations in the river increased from 0.01 to 0.06, upstream, to 0.42 to 2.37 mg/l, downstream from the discharge, producing violations of the Nebraska Water Quality Standards for ammonia.

During the survey a pump packing failed, allowing an estimated 40 lb of copper to enter the river. This discharge violates provisions in Section A-4 (no toxic materials shall be discharged) of the Nebraska Water Quality Standards. The State of Nebraska has required that this industry provide the equivalent of secondary treatment by 31 December 1975.

Company officials stated that at present there are no plans to construct waste treatment facilities.

11. Flinn Paving Company asphalt plant discharged to Little Papillion Creek untreated wastewater containing an average of 880 lb/day of suspended solids. The resulting discoloration and a sediment blanket constitute violations of the Nebraska Water Quality Standards. In addition, the company failed to provide adequate treatment by the compliance date of 1 January 1972.

12. The National By-Products, Inc., plant, prior to the fire that destroyed the plant on 18 August 1972, discharged wastewater to Papillion Creek that contained daily loads of 4,000 lb of BOD, 28,000 lb of COD, and 32,000 lb of suspended solids. The grease concentration ranged from 570 to 13,000 mg/l. The company has not complied with the 1 January 1972 date for construction of adequate waste treatment. A new processing plant and treatment facility are scheduled to be in operation by 1 July 1973. The company is considering either pretreatment of wastes with the effluent being discharged to the new Papillion Creek Wastewater Treatment Plant or treatment of wastes with the effluent being discharged to Papillion Creek. Design data related to the required treatment facilities for company wastewaters were not available at the time of the EPA survey. Thus, no evaluation of the capability to treat the waste load could be made.

13. In order to trace the dispersion of wastewater from National By-Products, Inc., in Papillion Creek and subsequently into the Missouri

River, Rhodamine WT dye was introduced into the industrial outfall. The dye was traced downstream into the Missouri River. Samples collected concurrently at selected points showed that the discharged wastes reached the river. The concentration of oil and grease in the Missouri River upstream (RM 596.68) was 9 mg/l or less, while downstream (RM 596.47) from the mouth of the Papillion Creek it was 790 mg/l or more. Analysis of samples from the effluent and the receiving waters by gas chromatographic technique positively identified the source to be National By-Products, Inc. Grease balls were observed in the effluent, in Papillion Creek downstream from the discharge, and in the Missouri River downstream from Papillion Creek. Violations of the Nebraska Water Quality Standards occurred (i.e., no visible film or globules of grease shall be present, and emulsified oil and grease shall be less than 15 mg/l).

14. Abatement of pollution of the Missouri River and tributaries in the Omaha area, has not been achieved, in spite of:

a. Promulgation of State-Federal Water Quality Standards applicable to interstate streams (the Missouri River);

b. Promulgation of State Water Quality Standards applicable to intrastate streams (Big-Little Papillion and Papillion Creeks):

c. Implementation schedules established in conjunction with the water quality standards;

d. Recommendations of Federal Enforcement Conferences:

e. The Omaha Industrial Waste Ordinance.

Moreover, except for improvements to two lift stations, necessary upgrading of sewers and lift stations, as well as adequate financing of required improvements in the collection and treatment systems are not presently in the active planning stages. The City of Omaha must take immediate steps toward the planning and financing of needed improvements in the collection and treatment systems in order to comply with the requirements of the 1972 Amendments.

15. The Federal Water Pollution Control Act Amendments of 1972 require that all industrial waste discharges must, by July 1977, meet effluent limitations based on the best practicable control technology currently available. The 1972 Amendments further require that publicly owned treatment works provide secondary treatment, as defined by the Administrator, by this same date. Further, the Amendments specifically provide that any effluent limitation or compliance schedule required by any State to be implemented prior to July 1977 will remain in effect (e.g., the 31 December 1975 compliance date established for the Missouri River and Papillion Creek wastewater treatment plants). In addition, the States can require compliance with any effluent limitation or schedule of compliance at dates earlier than those established statutorily. The 1972 Amendments establish a new national program for the elimination of pollution (National Pollutant Discharge Elimination System) from the waters of the United States and clearly contemplates that the States will assume primary responsibility for operating the permit system. Corrective action must be expeditiously taken in the Omaha area in order to comply with the requirements of the Act.

III. RECOMMENDATIONS

In order to abate pollution of the waters of the Missouri River and attain compliance with the 1972 Amendments to the Federal Water Pollution control Act it is recommended that:

1. Appropriate officials of the City of Omaha be formally advised that the following actions are required:

   a. All wastewaters discharged to the Missouri River and tributaries must receive secondary treatment by 31 December 1975.

   b. A program, including a time schedule acceptable to the State of Nebraska and EPA, must be developed and initiated immediately in order to replace the deteriorating combined sewers with separate storm and sanitary systems.

   c. The grit collection and pumping stations must be upgraded so that by-passing of raw sewage is eliminated at all points by 31 December 1975.

   d. Adequate financing be acquired to cover costs of this program which exceed available Federal funds.

   e. The industrial waste pretreatment ordinance be upgraded to comply with the 1972 Amendments and regulations published pursuant thereto.

   f. Treatment by the Central Wastewater Pretreatment Facility be upgraded to meet the requirements of the pretreatment ordinance and the 1972 Amendments.

   g. Planned improvements to the Leavenworth and Burt-Izard grit-removal facilities be completed by 31 December 1974 as scheduled by the City.

2. Until the proposed facilities are constructed, City of Omaha officials consider the installation of interim treatment measures [Appendix H] at the Missouri River and Papillion Creek WWTP.

3. The State of Nebraska, in the allocation of grant funds, continue to give a high priority to the construction of the new Papillion Creek and Missouri River Wastewater Treatment Plants by 31 December 1975; the effluent from these plants be required to meet the limitations based on secondary treatment being promulgated pursuant to the 1972 Amendments of the FWPCA.

4. The effluent limitations to be prescribed for the discharge permit to Allied Chemical Corporation, based on best practicable control technology and present production rates, include the following:

a. The suspended solids discharged shall not exceed 20 mg/l or 160 lb/day, whichever is less.

b. The Total Kjeldahl nitrogen (ammonia plus organic nitrogen) discharged shall not exceed 20 mg/l or 140 lb/day, whichever is less.

c. The nitrite-nitrate nitrogen shall not exceed 10 mg/l or 45 lb/day, whichever is less.

d. The oil and grease discharged shall not exceed 10 mg/l or 65 lb/day, whichever is less.

e. The pH shall be between 6.5 and 9.0.

f. No toxic or hazardous material, as designated under the provisions of Section 307 of the Federal Water Pollution Control Act as amended, or known to be hazardous or toxic by the permittee, shall be discharged except with the approval of the Administrator (EPA) or his designee.

5. The effluent limitations to be prescribed for the discharge permit to Flinn Paving Company include the following:

a. The suspended solids discharged shall not exceed 20 mg/l or 5 lb/day, whichever is less.

b. No oil and grease shall be discharged.

c. The pH shall be between 6.5 and 9.0.

6. National By-Products, Inc. provide pretreatment consistent with the requirements of the 1972 Amendments and discharge all wastewater to the new Papillion Creek WWTP, and EPA, Region VII, request additional information from National By-Products, Inc. on the status of new plant construction, with the following effluent limitations, based on best available control technology and present production rates, being prescribed for the discharge permit:

a. The BOD discharged shall not exceed 10 mg/l or 0.04 lb/1,000 lb raw material, whichever is less.

b. The suspended solids discharged shall not exceed 10 mg/l or 0.05 lb/1,000 lb raw material, whichever is less.

c. The oil and grease discharged shall not exceed 10 mg/l or 20 lb/day, whichever is less.

d. The number of fecal coliform bacteria in the effluent shall not exceed 1,000/100 ml.

e. The pH shall be between 6.5 and 9.0.

7. The effluent limitations to be prescribed for the discharge permit to Union Pacific Shops include the following:

a. The oil and grease discharged shall not exceed 10 mg/l or 50 lb/day, whichever is less, nor create a visible oil sheen on the water surface.

b. The suspended solids discharged shall not exceed 30 mg/l or 150 lb/day, whichever is less.

c. The pH shall be between 6.5 and 9.0.

IV. DESCRIPTION OF THE AREA

The Omaha metropolitan area is located on the west bank of the Missouri River in east central Nebraska [Figure 1]. The majority of the population and industrial activity is located in Douglas County, Nebraska. The Council Bluffs portion of the metropolitan area lies eastward across the Missouri River in Pottawattamie County, Iowa.

In 1970 the City of Omaha had a population of about 350,000 people living in the 79-square-mile corporate city limit. Total population of the metropolitan area was approximately 550,000. Suburban and nearby communities include Ralston, Millard, Irvington, LaVista, and Papillion, Nebraska, and Carter Lake and Council Bluffs, Iowa. South of Omaha lies Bellevue, Nebraska, and Offutt Air Force Base, Headquarters of the Strategic Air Command.

The transportation network responsible for making Omaha a key distribution point for the central United States includes four interstate highways, eight railroads, and five barge lines. The city is the fourth largest rail center in the country; the Union Pacific Railroad maintains its home office in Omaha. It is a major port on the Missouri River. A municipal dock has warehouses for storage of liquid-and solid-bulk commodities.

The metropolitan area has many diverse industrial and manufacturing activities. Omaha is the largest livestock market-meat processing center in the nation, also the second largest producer of frozen food products and one of the more important grain markets. Typical products manufactured by other area industries include: furniture, clothing, paper boxes, batteries, soap, farm machinery, feeds, fertilizers, railroad equipment, serums, boots, and paints. In addition, the city is an important communications and medical insurance center.

The Omaha area is situated midway between two distinctive climatic zones, the humid east and the dry west. This causes a wide fluctuation and rapid changes in weather conditions. The average annual temperature is about 52 degrees, with daytime summer and winter temperatures averaging about 86 and 33 degrees, respectively. The average frost-free period is 188 days. Most precipitation falls as evening or nighttime showers and thundershowers during the six-month period, April through September. The average normal precipitation rate is about 26 inches, with only ten percent of this falling as snow during the winter months.

The metropolitan area lies on gentle hills, ranging from 962 to 1,270 feet above sea level, adjacent to the Missouri River. Construction of levees, bank stabilization programs, and six main-stem dams on the upper reaches of the river have made the river virtually flood-free through this stretch. This river channelization has created flow velocity which reaches a three-to-five mile-per-hour rate in certain sections depending upon the river stage. Several of the area industries are located adjacent to the river in areas protected by the levee system.

The Missouri River has an average flow of about 35,000 cubic feet per second (cfs). Extremes in flow range from 1,600 cfs to more than 400,000 cfs. The low flow of record occurred prior to the construction

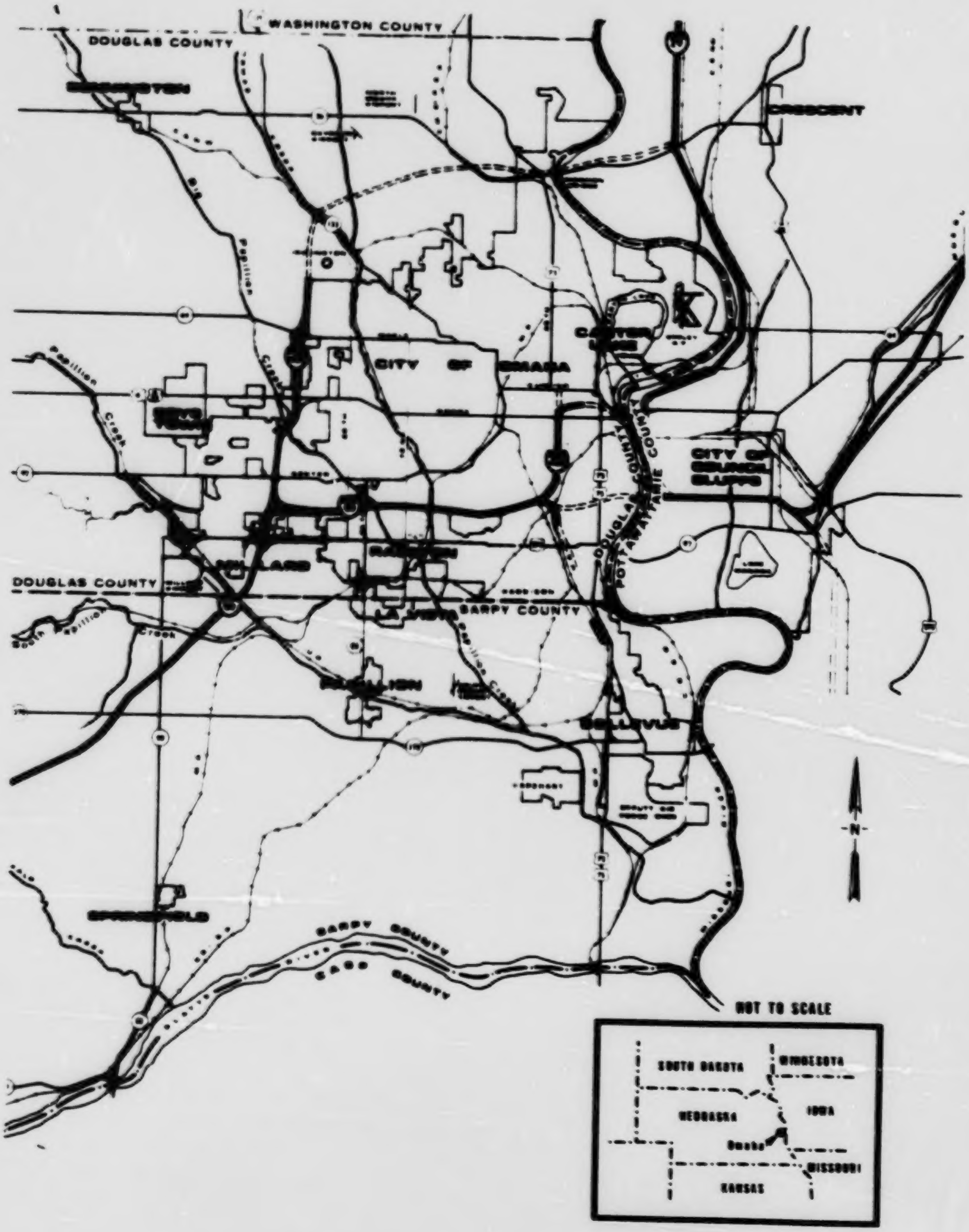

WASHINGTON COUNTY
DOUGLAS COUNTY
CRESCENT
CITY OF OMAHA
CARTER LAKE
CITY OF COUNCIL BLUFFS
Papillion Creek
DOUGLAS COUNTY
POTTAWATTAMIE COUNTY
MILLARD
RALSTON
LA VISTA
SARPY COUNTY
South Papillion Creek
PAPILLION
BELLEVUE
SPRINGFIELD
SARPY COUNTY
CASS COUNTY
-N-
NOT TO SCALE
SOUTH DAKOTA
MINNESOTA
NEBRASKA
IOWA
Omaha
MISSOURI
KANSAS

Figure 1. Location Map-Missouri River, Omaha, Nebraska

of the six different upstream regulating reservoirs. The last major dam on the Missouri was closed in the early 1960's, providing almost 76 million acre-feet of storage in the upper reach of the system. Such a low flow is not expected to occur again in the future.

As a general rule, two distinct flow conditions prevail in the Missouri River at Omaha. Approximately nine months of the year, navigation flows are maintained at 30,000 cfs or more. During the three winter months, flows range between 10,000 and 15,000 cfs with the upper reaches subject to periods of ice cover and ice jams.

Papillion Creek and its tributaries flow through the Omaha metropolitan area, discharging into the Missouri River south of Bellevue [Figure 1]. The tributaries include West Papillion Creek, Big Papillion Creek, and Little Papillion Creek. In the lower reach of Papillion Creek, the flow consists primarily of small industrial discharges and municipal sewer effluents that also contain industrial wastes and urban runoff.

V. WASTE SOURCES

Two municipal and six industrial waste sources [Table 1] were evaluated, from 30 July to 12 August 1972, in order to determine the characteristics of the discharge and receiving waters [Figure 2 and 3]. The two municipal sources, the Missouri River and Papillion Creek Wastewater Treatment Plants, serve a total population of approximately 362,000. Numerous small treatment plants in the Papillion Creek watershed [Table 2] are presently in operation. However, proposed abatement plans include abandonment of these plants with all wastes being diverted to the new Papillion Creek treatment plant as soon as it is completed. The sewerage system for the Missouri River plant was evaluated relative to operation problems and the incidence of by-passing.

The industrial waste sources evaluated include:

1. Allied Chemical Corporation
2. Central Wastewater Pretreatment Facility
3. Flinn Paving Company asphalt plant
4. National By-Products, Inc.
5. The Quaker Oats Company
6. Union Pacific Shops

At each of the facilities data were obtained on water-pollution control practices. Specifically, information included in this section was secured through in-plant surveys, inspection of Refuse Act Permit applications, and contact with plant representatives. [Individual reports on each municipal and industrial waste source evaluated are contained in Appendices B and C, respectively. Study methods and custody procedures are discussed in Appendices D and E.]

TABLE 1

MAJOR MUNICIPAL AND INDUSTRIAL SOURCES - MISSOURI RIVER
OMAHA, NEBRASKA
JULY-AUGUST 1972

Map Key[a]	Name	Receiving Water	Treatment Facilities	Abatement Needs	Remarks
A	Missouri River Wastewater Treatment Plant (RM 611.58)	Missouri River	Grease removal Primary clarifiers	Additional grease removal Pretreatment of industrial wastes; secondary treatment; adequate disinfection	City plans to have a new secondary treatment plant in operation by 12/31/75.
B	Papillion Creek Wastewater Treatment Plant (RM 596.60/8.30/4.41)[b]	Big Papillion Creek	Secondary activated sludge plant	Construction of a new secondary treatment plant with disinfection	Owing to hydraulic overloading only 13 mgd receives secondary treatment, with the remaining flow receiving primary. The City plans to have a new plant located at the mouth of Papillion Creek, in operation by 12/31/75.
C	Allied Chemical Corp. - Agriculture Division (RM 592.26)	Missouri River	None	Installation of the best practicable control technology currently available for this industry	The company had no immediate plans to construct treatment facilities.
D	Central Wastewater Pretreatment Facility	Missouri River Wastewater Treatment Plant	Grease and Paunch removal	Improved suspended solids and grease removal	Roughing filters are to be constructed at the Missouri River Wastewater Treatment Plant to further treat the effluent from this facility.
E	Flinn Paving Company asphalt plant (RM 596.60/8.30/5.42/1.73)	Little Papillion Creek	None	Installation of the best practicable control technology currently available for this industry	Spilled asphalt was discharged to the Creek.
F	National By-Products, Inc.[c] (RM 596.6/2.0)	Papillion Creek	Primary clarifiers	Installation of the best practicable control technology currently available for this industry	Company is constructing an entirely new plant and treatment facilities. The new facility is scheduled to be in operation by 7/1/73.
G	The Quaker Oats Company (cooling water - RM 615.23)	Process Water Missouri River Wastewater Treatment Plant	pH control	Pretreatment of wastewater to meet the requirements of the 1972 Amendments and the Omaha Industrial Waste Ordinance	Company plans to construct a clarifier to reduce suspended solids concentration to 100 mg/l or less.
		Cooling Water Missouri River	None	Temperature control	Company is considering building a cooling tower and recirculating the cooling water.
H	Union Pacific Shops (RM 616.15)	Missouri River	Oil separation and solids removal	None	

---

[a] See Figures 2 and 3.

[b] This number describes the location of the waste source. After each slashline (/) a new stream is denoted. This waste source location can be described as follows: Mile 596.60 on the Missouri River is the mouth of Papillion Creek; upstream 8.30 miles from the mouth of Papillion Creek is the mouth of Big Papillion Creek; 4.41 miles upstream from the mouth of Big Papillion Creek is the location of the Wastewater Treatment Plant.

[c] The plant was destroyed by fire on 18 August 1972.

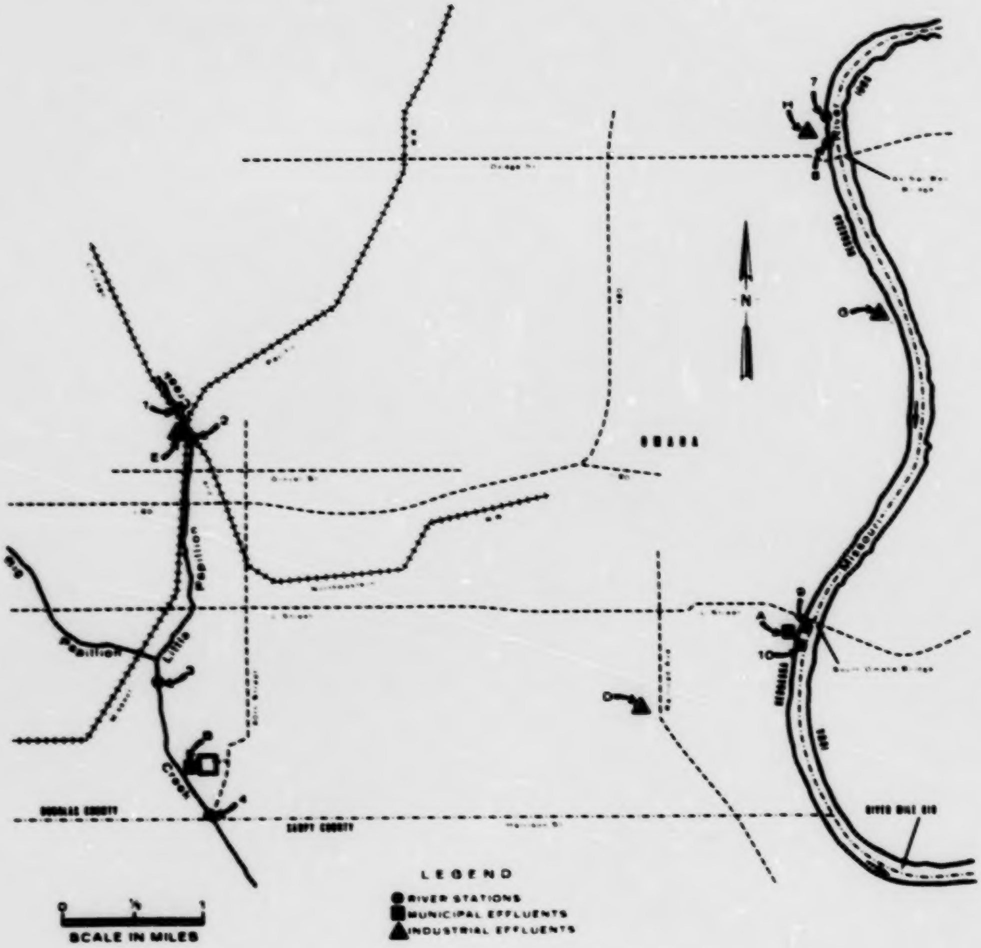

7
H
8
N
G
OMAHA
Missouri
9
A
10
South Omaha Bridge
D
Big
Papillion
Little
Papillion
Creek
1
2
E
3
4
DOUGLAS COUNTY
SARPY COUNTY
LEGEND
RIVER STATIONS
MUNICIPAL EFFLUENTS
INDUSTRIAL EFFLUENTS
0
½
1
SCALE IN MILES

Figure 2 Sampling Locations Omaha, Nebraska Area

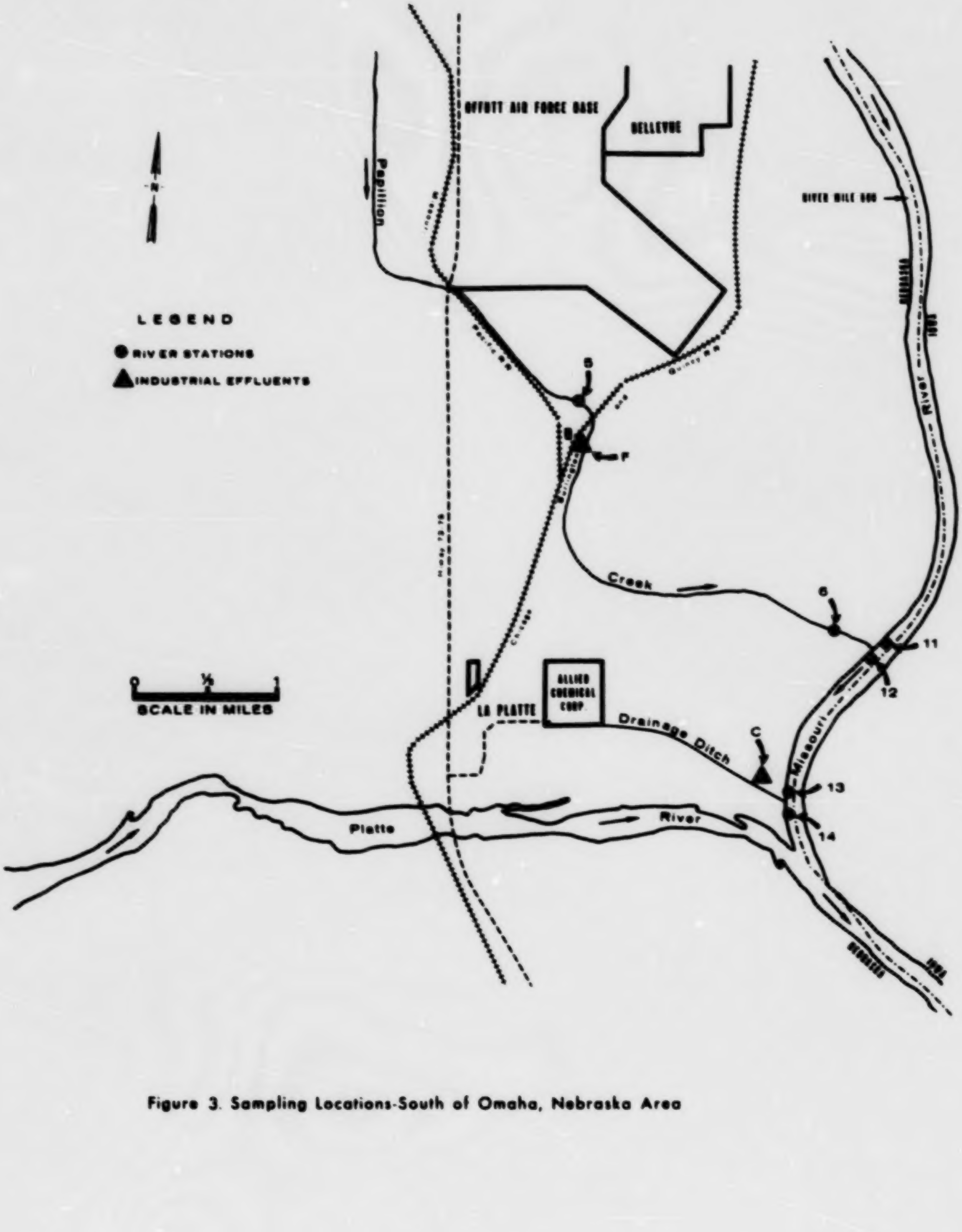

OFFUTT AIR FORCE BASE
BELLEVUE
Papillion
N
RIVER MILE 600
NEBRASKA
IOWA
River
LEGEND
● RIVER STATIONS
▲ INDUSTRIAL EFFLUENTS
5
F
Creek
6
11
12
0
½
1
SCALE IN MILES
ALLIED CHEMICAL CORP.
LA PLATTE
Drainage Ditch
C
Missouri
13
14
Platte
River
NEBRASKA
IOWA

Figure 3. Sampling Locations-South of Omaha, Nebraska Area

TABLE 2

MINOR MUNICIPAL WASTEWATER TREATMENT FACILITIES IN THE PAPILLION CREEK WATERSHED

Name of Facility[a]	Estimated Present Flow (mgd)	Receiving Stream	Type of Treatment	Remarks
Bellevue No. 2 Plant	1.5	Papillion Creek	2 mgd, primary; 1 mgd, secondary (standard rate TF)	Part of the flow receives secondary treatment. The remainder, only primary treatment.
District 31 Plant	1.0	Hell Creek	Secondary - trickling filter and extended aeration	Hydraulically and organically overloaded. Designed for 0.7 mgd.
Holling Heights Plant	0.71	West Papillion Creek	Secondary - contact stabilization	The plant is reported to be obtaining 93% BOD and 92% suspended solids removal. Designed for 1.25 mgd.
Jacobson Plant	0.22	West Papillion Creek	Secondary - contact stabilization	Plant designed for 0.20 mgd. The plant is reported to be obtaining 70% BOD, 39% suspended-solids removal.
LaVista Plant	0.58	Big Papillion Creek	Secondary - contact stabilization	Plant designed for 0.5 mgd. Due to hydraulic overload BOD reduction has been 65 to 75%.
Oak Hills Plant	0.12	West Papillion Creek	Secondary - trickling filter	Plant designed for 0.21 mgd. Plant is reported to be obtaining 89% BOD and 82% suspended solids removal.
Offutt Air Force	1.2	Papillion Creek	Secondary - trickling filter	Based on a survey by Kelly Air Force Base, BOD and suspended-solids removals were 75 and 63%, respectively.
City of Papillion	0.5	Papillion Creek	Secondary - contact stabilization	Effluent BOD and suspended solids concentrations are reported to be less than 30 mg/l each.

---

[a] Except for the City of Papillion plant, these facilities will be abandoned after the proposed Papillion Creek WWTP is completed.

A. MUNICIPAL

Missouri River Wastewater Treatment Plant

The Missouri River plant is a primary treatment facility with dry- and wet-weather design flows of 72 and 200 mgd, respectively. Based on the report of the design engineers,[7] the dry-weather wastewater flow in 1970 was estimated to be 38 mgd of which more than 50 percent was of industrial origin. According to the report, more than 60 percent of this flow (24 mgd) is received in the north inlet, with the remainder (14 mgd) entering the plant through the south inlet. As a result of inoperative lift stations (e.g., Leavenworth, Jones Street, and Hickory Station) -- during the survey, at least 14 mgd of raw sewage was being by-passed to the Missouri River as only 9.7 mgd was being received in the north inlet.

Only three of the eight primary clarifiers were in use. The average detention time in each clarifier was 1.87 hr (design, 1.8 hr) The wastewater was septic (i.e., black coloration and the odor of H_2S) at the north inlet and in the clarifiers. Hydrogen peroxide was being added to the influent to help control the odor problem with apparent success; the septic odors were confined mainly to the vicinity of the north inlet and the clarifiers.

The in-plant survey showed that BOD removal ranged from minus 39 (increase in BOD) to 38 percent, with an average of 13 percent [Table 3]. These low removal efficiencies demonstrate that treatment of the wastewater is not adequate (i.e., the average removal efficiency is generally less than the 35 percent that normally can be achieved from a primary

TABLE 3

SUMMARY OF ANALYTICAL DATA FOR MUNICIPAL AND INDUSTRIAL WASTE-SOURCE EVALUATIONS
MISSOURI RIVER - OMAHA, NEBRASKA AREA
JULY-AUGUST 1972

	Parameter[a]									
Description	Flow mgd (Avg)	pH (Range)	Conductivity µmhos/cm (Range)	Temp °C (Range)	BOD Range	BOD Average	COD Range	COD Average	TOC Range	TOC Average
Missouri River WWTP										
N Inlet Influent	9.7	1.5-11.3	600-3,000	20-32	160-1,000	450	380-1,900	900	120-480	240
S Inlet Influent	16.5	5.6-8.6	1,050-3,500	20-28	170-910	680	380-2,080	1,460	130-420	340
Final Effluent	26.2	2.1-7.2	950-2,700	21-28	380-700	480	760-1,100	900	210-310	250
Papillion Creek WWTP										
Influent	27.3	6.6-7.3	625-1,100	15-20	130-170	160	375-410	400	99-140	120
Effluent	27.3	6.6-7.0	750-1,000	16-20	110-140	130	270-360	330	82-110	94
Allied Chemical Corporation										
Effluent	20.3	6.6-9.4	675-1,300	28-38			24-25	24	11-21	16
Central Wastewater Pretreatment Facility										
Influent	6.35	6.0-9.5	1,400-5,600	25-40	280-1,500	1,100	330-16,000	7,100	78-1,000	810
Effluent	6.35	5.5-7.8	1,700-3,800	26-38	640-1,700	1,300	760-4,480	2,900	210-1,000	740
Flinn Paving Company asphalt plant										
Effluent	0.027	7.9-10.9	300-2,000	13->50						
National By-Products, Inc.										
Effluent	0.275	6.0-8.3	500-3,000	20-54	1,200-2,300	1,800	2,280-22,500	12,000	600-680	640
The Quaker Oats Company										
Pierce Street Sewer Upstream		7.1-8.5	375-700	24-30	260-450	330	230-530	360	63-170	110
In-Plant Station[f]		3.1-10.0	800-5,500	46-62	2,600-3,000	2,800	3,600-4,150[e]	3,900	1,400-1,400[e]	1,400
Pierce Street Sewer Downstream		4.0-11.0	700-6,000	45-56	2,400-2,700	2,600	3,230-3,840	3,500	980-1,450	1,100
Cooling Water Intake	6.9[g]	6.2-8.6	400-750	23-24			56-78	66	7-11	9
Cooling Water Effluent	6.9[g]	6.8-8.5	500-850	42-56			23-83	45	5-6	5
Union Pacific Shops										
Effluent	0.64[g]	6.5-8.5	450-2,000	23-34			37-88	64	13-24	18

TABLE 3 (Cont.)

SUMMARY OF ANALYTICAL DATA FOR MUNICIPAL AND INDUSTRIAL WASTE-SOURCE EVALUATIONS
MISSOURI RIVER - OMAHA, NEBRASKA AREA
JULY-AUGUST 1972

Description	Parameter[a]							
	Total Solids		Suspended Solids		Settleable Solids[b]		Oil & Grease[c]	
	Range	Average	Range	Average	Range	Average	Range	Average
Missouri River WWTP								
N Inlet Influent	1,200-2,900	1,760	216-488	328			14-120	47
S Inlet Influent	1,470-2,810	2,220	248-1,060	724			78-300	200
Final Effluent	1,600-2,060	1,800	328-520	423	2.5-4.2	3.4	88-150	120
Papillion Creek WWTP								
Influent	800-920	850	160-190	170				
Effluent	750-860	810	170-210	190			11-51	28
Allied Chemical Corporation								
Effluent	607-707	661	38-51	46			17-1,100	220
Central Wastewater Pretreatment Facility								
Influent	2,250-9,960	4,830	104-5,050	2,780			120-7,400	4,200
Effluent	2,010-3,050	2,770	252-2,040	1,130			55-1,400	500
Flinn Paving Company asphalt plant								
Effluent	2,600-9,500	6,050	1,910-6,600	4,100	18-31	23	24-19,000[d]	6,400
National By-Products, Inc.								
Effluent	25,300-35,500	30,500	12,000-16,000	14,000			570-13,000	6,800
The Quaker Oats Company								
Pierce Street Sewer Upstream	540-1,070	780	134-296	235				
In-Plant Station[f]	5,060-5,920	5,400	472-682	586				
Pierce Street Sewer Downstream	4,720-5,890	5,250	628-2,830	1,890				
Cooling Water Intake	534-612	575	76-110	88				
Cooling Water Effluent	549-660	622	62-114	82				
Union Pacific Shops								
Effluent	745-954	827	17-48	30			3-8	6

---

[a] All units are in mg/l unless otherwise noted.
[b] These units are in ml/l.
[c] These are hexane-extractable materials.
[d] Large piece of tar was in the sample.
[e] This range represents two days data.
[f] This station contains the majority of the wastewater flow.
[g] Flow values were obtained from company officials.

treatment facility). The major portion of the organic loading (121,000 lb/day of BOD) received is from the Central Wastewater Pretreatment Facility (72,600 lb/day of BOD). Operational problems at the pretreatment plant directly affect the operation of the Missouri River plant. If one of the separation basins fails to remove grease, the grease load to the Missouri River plant increases, and the skimmers on the primary clarifiers cannot remove this additional grease.

The log-mean fecal-coliform bacterial density in the effluent was 17,000,000/100 ml [Table 4]. This discharge violates the Nebraska water-quality criterion for fecal coliform of 2,000/100 ml causing an increase in organisms in the Missouri River; the numbers rise from 4,100/100 ml upstream (RM 611.42) to 57,000/100 ml downstream (RM 611.42). Thus, even if the upstream bacterial contamination was reduced, the standards would be violated as a result of the discharge from the Missouri River plant.

The Nebraska Department of Environmental Control has required that the City of Omaha, by 31 December 1975, have secondary treatment facilities with disinfection in operation. An engineering study has been completed, and a construction grant application submitted. Estimated construction costs are 30 million dollars.[8/] Information obtained from EPA construction grants personnel, Region VII, indicated that Federal funds will not be available for this grant until at least 1975.[8/] City officials stated that without adequate funding support the 1975 date would not be met.[9/] With the required installation of secondary treatment facilities by

TABLE 4

SUMMARY OF BACTERIOLOGICAL ANALYSES OF MUNICIPAL AND INDUSTRIAL WASTE DISCHARGES
OMAHA, NEBRASKA
JULY-AUGUST 1972

Map Key[a/]	Station Description	Dates	Total Coliforms/100 ml			Fecal Coliforms/100 ml			Fecal Streptococci/100 ml		
			Max.	Log Mean	Min.	Max.	Log Mean	Min.	Max.	Log Mean	Min.
A	Missouri River Wastewater Treatment Plant effluent	8/1-8/3				$24x10^6$	$17x10^6$	$8.2x10^6$	$3.3x10^6$	$1.3x10^6$	$0.63x10^6$
F	National By-Products, Inc. effluent	7/31-8/5	$28x10^6$	$4x10^6$	$1x10^6$	$3.5x10^6$	$0.52x10^6$	$0.17x10^6$	$9.2x10^6$	$1.1x10^6$	$0.13x10^6$

---

a/ See Figures 2 and 3.

31 December 1975 and the unavailability, before FY 1975, of construction grant funds, the City of Omaha could make an effort to improve the present primary facilities. There are several possible interim measures [Appendix H, Section B] to improve existing treatment efficiencies at the Missouri River WWTP. These measures could be used until the new plant facilities are operative.

Secondary treatment design data pertaining to the required improvements at the Missouri River plant were reviewed. The new facilities consist of two-stage secondary treatment of the south inlet flow employing roughing filters followed by completely mixed activated-sludge treatment, and completely mixed, activated-sludge treatment of the north inlet flows. The facilities are designed for a dry-weather flow of 65 mgd and a minimum of 90 percent removal of BOD and suspended solids. However, without pretreatment of industrial wastewater the requirements of the 1972 Amendments* will not be met.

The pH fluctuations observed in the effluent (2.1 to 7.2) indicate that operational problems could result in the biological treatment system. The City of Omaha must enforce the industrial waste ordinance in order to prevent these wastes from upsetting the proposed biological treatment system.**

---

* The Federal Water Pollution Control Act Amendments of 1972 require that for publicly owned treatment works, effluent limitations based on secondary treatment must be met by 1 July 1977. In order currently to meet the requirements of the Act EPA is proposing to limit both BOD and SS to a monthly average of 30 mg/l and weekly average of 45 mg/l, or 85 percent overall reduction, whichever produces better water quality. This level of treatment is obtainable through secondary treatment. Further, the proposed regulations limit the fecal-coliform bacterial density to a weekly average of 400/100 ml and a monthly average of 200/100 ml.

** Section 307 of the 1972 Act requires the establishment and enforcement of pretreatment standards for pollutants that would prevent publicly owned treatment works from meeting effluent limitations established for such treatment works.

Papillion Creek Wastewater Treatment Plant

The existing Papillion Creek plant is a secondary treatment facility with a design capacity of 18 mgd. According to plant officials, about 15 percent of the flow is of industrial origin. No disinfection of the effluent is being provided.

The in-plant survey, 8 through 10 August 1972, indicated that the plant was receiving an average daily flow of 27.3 mgd with peak flows in excess of 38 mgd. Only 13 mgd received secondary treatment, with all flow in excess of this amount receiving only primary treatment. The overall BOD removal efficiency ranged from 15 to 23 percent. During the three-day survey the suspended-solids concentrations in the effluent exceeded that in the influent [Table 3]. The plant is both hydraulically and organically overloaded. Moreover, the Papillion Creek plant does not meet the Nebraska Water Quality Standards that required the implementation of secondary treatment and disinfection by 1 January 1972.

The City of Omaha plans to construct a new secondary treatment facility near the mouth of Papillion Creek by 31 December 1975. This new facility will treat wastewaters now treated at the Papillion Creek plant as well as wastewater presently treated at Holling Heights, Oak Hills, Jacobson, La Vista, District 31, Bellevue No. 2, and Offutt Air Force Base.

The design engineers, Hennington, Durham and Richardson, have recommended that a 70-mgd trickling filter-activated sludge treatment plant be constructed based on projected 1995 flows. The plant is designed to provide 90 percent BOD removal with the final effluent BOD and suspended solids levels each to be 35 mg/l or less. These levels are commensurate with the secondary-treatment effluent limitations proposed by EPA pursuant to the 1972 Amendments of the Federal Water Pollution Control Act.

The new plant will be built in three phases -- 35, 15, and 20 mgd, respectively. Construction grants have been approved for the first two phases, with anticipated completion 860 days after the awarding of the grant. The City is currently considering an additional bond issue (financed by increased sewer rates) to cover part of the cost of the second phase of the plant (15 mgd).

Thus, a 50-mgd plant should be operative by the 31 December 1975 deadline. A grant application has been made for the third phase; however no funds will be available for this project until at least FY 1975. With the unavailability of funds some effort could be made to improve the existing Papillion Creek WWTP. Interim treatment measures [such as discussed in Appendix H, Section C] could improve present plant removal efficiencies.

B. INDUSTRIAL

Results of industrial evaluations are summarized in the following paragraphs. [Additional details on the in-plant evaluations that were conducted during the survey can be found in Appendix C.] Pollution abatement measures were predicated on the installation of best practicable control technology currently available for each industry and compliance with water quality standards.

Allied Chemical Corporation - Agriculture Division

This company manufactures liquid nitrogen fertilizer (1,250 ton/day), urea (450 ton/day), nitric acid (290 ton/day), anhydrous ammonia (610 ton/day), and ammonium nitrate (360 ton/day). All nitric acid produced is converted to ammonium nitrate.

Wastewaters from the nitric acid-ammonia nitrate process operations (2.4 to 3.5 mgd); urea process (6.8 to 8.3 mgd); ammonia synthesis process-Train I (9.3 to 9.5) mgd); and ammonia synthesis process-Train II (0.29 to 0.35 mgd) eventually combine and are discharged without treatment, through an open ditch, to the Missouri River (RM 595.26).

The Refuse Act permit application* states that the average daily discharge (19.7 mgd) to the Missouri River contains 86 mg/l of suspended solids, 80 mg/l of ammonia, and 2 mg/l of oil and grease. Except for oil and grease, the quantities found as a result of the in-plant survey were not significantly different from those stated in the application. The discharge to the river contained 45 mg/l of suspended solids, 200 mg/l of oil and grease, and 77 mg/l of ammonia (NH_3-N). In the Missouri River ammonia concentrations ranged from 0.01-0.06 mg/l upstream of, and 0.42-2.37 mg/l downstream from, the Allied Chemical effluent channel. The Nebraska water quality criterion for ammonia were violated at the downstream concentrations [Appendix A].

During the survey a copper acetate spill occurred because of faulty packing in a pump located in the Train II processing area. The spill resulted in approximately 40 lb of copper being discharged to the river, which violates Section A-4 of the Nebraska Water Quality Standards.

---

* The 1972 Amendments provide that the Refuse Act permit applications be processed through the National Pollutant Discharge Elimination System (NPDES).

These Standards require the equivalent of secondary treatment, by 31 December 1975, for all wastes discharged to the Missouri River. The 1972 Amendments require that a permit be obtained for this discharge, and that best practicable control technology be applied. Company officials stated that, at present, the firm had no plans to construct wastewater treatment facilities.

Central Wastewater Pretreatment Facility

This facility, also known as the Carver-Greenfield Plant, receives wastewater from 13 meat-packing houses located in South Omaha. The facility was designed to remove paunch manure and grease from the wastewater prior to its being discharged to the Missouri River Wastewater Treatment Plant. The maximum concentration of suspended solids that can be discharged under the City of Omaha Industrial Waste Ordinance is 400 mg/l. In addition, the maximum daily grease load to be received at the south inlet of the Missouri River WWTP (i.e., the point where the effluent from the pretreatment facility enters) was not to exceed 18,000 lb.[4/]

An in-plant survey was conducted 30 July through 5 August 1972 in order to ascertain the daily waste quantities being discharged to the Missouri River WWTP. The survey verified that the facility received weak wastes on the 30 July (Sunday) — because of the limited activity in the packing houses. Effluent concentrations on that Sunday met the Omaha City Ordinance, as suspended-solids and oil-and-grease concentrations were 252 and 55 mg/l, respectively. On the other hand during the period 31 July through 5 August 1972 the concentration of suspended solids averaged 1,280 mg/l, or more than three times the value stipulated by the City ordinance. Maximum flows during the six-day period occurred from 0800 to 2100 hr and averaged 7.5 mgd. Concentrations of oil and grease in the samples collected during the period (one grab sample daily) ranged from 240 to 1,400 mg/l (average of 580 mg/l), thus yielding an average grease load of 19,500 lb daily during the 13-hr period.* This load violates requirements established by the enforcement conference.

The six-day flow (3.54 to 8.21 mgd) constituted from 25 to 48 percent of the flow received in the south inlet of the Missouri River plant. The amount of suspended solids discharged by the pretreatment facility ranged from 24 to 86 percent of the load received at the south inlet. These high loads of suspended-solids, as well as the grease loads, adversely affect the operation of the Missouri River wastewater treatment plant. With an increasing grease load the skimmers on the clarifiers were unable to remove all the grease; the excess was discharged to the Missouri River.

The Federal Water Pollution Control Act Amendments of 1972 stipulate that the EPA Administrator publish regulations requiring that industrial wastewaters which are discharged to publicly owned treatment works be pretreated to meet specific standards. While such regulations have not been issued, it is expected that the standards will require removal of pollutants to levels that will neither inhibit treatment of the combined wastes or pass through the public system in concentrations inconsistent with required effluent limitations. The Central Wastewater Pretreatment Facility will probably not meet these requirements. Implementation of measures for upgrading the wastewater pretreatment facility [such as those discussed in Appendix H, Section D] will be necessary to meet the effluent limitations.

---

* Although no oil and grease samples were collected during the night, grease was visible in the effluent at all times.

Flinn Paving Company Asphalt Plant

This company produces, from April through December, an average of 300 tons/day of asphaltic concrete (paving material). Water from the air scrubber was discharged to Little Papillion Creek (RM 596.60/8.30/5.42/1.73) without treatment. Spilled asphaltic cement from the storage tank area was observed entering the effluent stream. The company has failed to provide the equivalent of secondary treatment by 1 January 1972, as required by the Nebraska Water Quality Standards.

On its Refuse Act permit application the company reported that it discharges a 0.051 mgd effluent containing 6,120 mg/l suspended solids and no measurable quantity of oil and grease.

Results of the in-plant survey, 7 through 9 August 1972, showed that concentrations of suspended solids and of oil and grease ranged from 1,900 to 6,600 mg/l and from 24 to 19,000 mg/l, respectively [Table 3]. Chunks of asphaltic cement were visible in the effluent and account for these high concentrations of oil and grease. Preventative measures such as dikes around the storage tanks and the loading areas could eliminate future discharges of oil and grease. Company officials stated they are considering the installation of settling ponds and the use of chemical flocculants to reduce suspended solids in the effluent.

Little Papillion Creek downstream from this discharge was visibly discolored, and a sediment blanket covered the bottom of the creek. These conditions violated the General Water Quality Criteria of the Nebraska Water Quality Standards relative to bottom deposits, turbidity, and color. The discharge is also subject to the 1972 Amendments which require that a permit be obtained and best practicable control technology be applied.

National By-Products, Inc.

Prior to the fire which on 18 August 1972 destroyed the National By-Products plant, the company was processing approximately 1,500,000 lb/week of fats and proteins that were used in animal and fowl feeds. All wastewater was treated in two primary clarifiers operated in parallel. The effluent was discharged to Papillion Creek (RM 596.6/2.0).

The Nebraska Water Quality Standards established a compliance date of 1 January 1972 for the industry to provide the equivalent of secondary treatment. The 1972 Amendments require that a permit be obtained for this discharge and that best practicable control technology be applied. The company failed to meet this date, but no action was taken against them by the State. The company has filed a Refuse Act permit application* which indicates that the daily waste discharge was 0.25 mgd containing 3,960 lb of BOD, 8,000 lb of COD, 1,220 lb of suspended solids, and 32 lb of oil and grease.

---

* The 1972 Amendments provide that the Refuse Act permit application be processed through the National Pollutant Discharge Elimination System (NPDES).

On the other hand, results of the in-plant survey indicated that National By-Products, Inc., discharged average daily loads of 4,000 lb of BOD, 28,000 lb of COD, and 32,000 lb of suspended solids. The oil-and-grease concentration ranged from 570 to 13,000 mg/l [Table 3]. The log mean of total- and fecal-coliform bacteria densities were 4,000,000 and 520,000/100 ml, respectively [Table 4].

Rhodamine WT dye was used to trace the effluent from the point of discharge downstream to the confluence with the Missouri River. Samples were collected for oil-and-grease analyses from the effluent, from Papillion Creek upstream and downstream from the discharge, and from the Missouri River upstream and downstream from Papillion Creek, concurrently with the dye trace.* The results indicated that the grease concentration in the Missouri River upstream was 9 mg/l or less, and increased to 790 mg/l or greater downstream from the mouth of Papillion Creek. The latter concentration constitutes a violation of the oil-and-grease water quality criterion established for the Missouri River (maximum of 5 mg/1 of emulsified oil and grease).

---

* The samples were hydrolyzed and characterized by gas chromatography. The results showed that the grease contained esters of stearic, palmitic, and myristic acids. (Animal fats are made up of glycerol esters of these parent acids.) These esters were not evident in Papillion Creek upstream of the discharge or in the Missouri River upstream of the mouth of the Creek. These techniques, therefore, positively identify the grease as being from National By-Products, Inc.

National By-Products, Inc., is building a new process plant and treatment facilities, to be in operation by 1 July 1973. They are currently negotiating with the City of Omaha to connect to the new Papillion Creek WWTP interceptor. The City will require pretreatment of the wastewaters. City pretreatment requirements should be consistent with levels developed pursuant to the 1972 Amendments. If such a connection is not made, the company must provide complete treatment consistent with best practicable control technology.*

The Quaker Oats Company

This company manufactures furfural, furfuryl alcohol, and levulinic acid. Process wastes are neutralized and discharged into the Pierce Street sewer. Once-through cooling water is discharged to the Missouri River (RM 615.23) without treatment.

Results of the in-plant survey revealed that the process wastewater contained at least 21,000 lb of BOD, 10,200 lb of TOC, 4,400 lb of suspended solids, and 900 lb of furfural. The high concentration of suspended solids (600 mg/1), which violates requirements of the Omaha Industrial Waste Ordinance, causes operational problems (e.g., broken screw conveyors, broken elevator chains and buckets, etc.) in the grit removal facility in the Pierce Street Lift Station.

---

* Industrial wastes shall receive treatment that is obtainable by installation of best practicable control technology currently available for each particular industry.

During the survey the Pierce Street sewer by-passed flow to the Missouri River. Analysis of the wastewater in the Pierce Street sewer downstream from Quaker Oats indicated a furfural concentration of 75 to 110 mg/l. There were no samples collected from the Missouri River to show the effect of this by-pass. However, the furfural concentration may exceed levels (6-25 mg/l) known to be toxic to fish.[10/]

A new clarifier, scheduled to be in operation 1 January 1973, is designed to produce an effluent containing 100 mg/l or less of suspended solids. [Construction difficulties have caused this date to be postponed to 1 June 1973.] Additional treatment is needed to reduce the BOD and furfural loads in order to meet pretreatment requirements [Appendix F].

Union Pacific Shops

The Union Pacific Shops service, repair, and maintain railroad equipment. All wastewater, including storm run-off, is collected and pumped to their treatment plant. The plant, designed for 1,200 gpm (1.73 mgd), consists of two settling basins equipped with oil skimmers and an air flotation tank. The effluent is discharged into the Missouri River at RM 616.15.

Results of the in-plant survey indicated that the effluent discharged by Union Pacific Shops met the requirements of best practicable control technology. This discharge does not cause detectable changes in oil and grease concentrations in the Missouri River [Table 3].

C. SEWERAGE SYSTEM

The Missouri River Wastewater Treatment Plant treats wastes originating in the northern and southern portions of the City of Omaha. It has been estimated that more than 60 percent (24 mgd) of the wastewater (38 mgd)* received at the plant originates in the northern portion of Omaha and enters the treatment plant through the north inlet. The remaining flow originates in the southern portion of Omaha and enters the plant through the south inlet. Approximately 40 percent of the industrial wastewater is received in the south inlet of the Missouri River plant.[7]

Wastewater and storm run-off originating in each service area flow by gravity through combined sewers [Figure 4] to 22 diversion structures and are then pumped to the Missouri River WWTP by 11 lift stations located along the Missouri River [Table 5]. The 10 lift stations in North Omaha pump the flow into an interceptor sewer that has been laid parallel to the Missouri River. The one lift station in South Omaha pumps directly into the Missouri River WWTP. This system of diversion structures, lift stations, and interceptors by-passes excess wastewater directly to the Missouri River when the flow exceeds a set ratio of the designed, dry-weather flow. Upstream of the Council Bluffs Water Intake (RM 618.8) the design ratios are five times the dry-weather design flow for the Minne Lusa and Bridge Street structures [Table 6]. The design

---

* More than 50 percent of this flow is of industrial origin.[7]

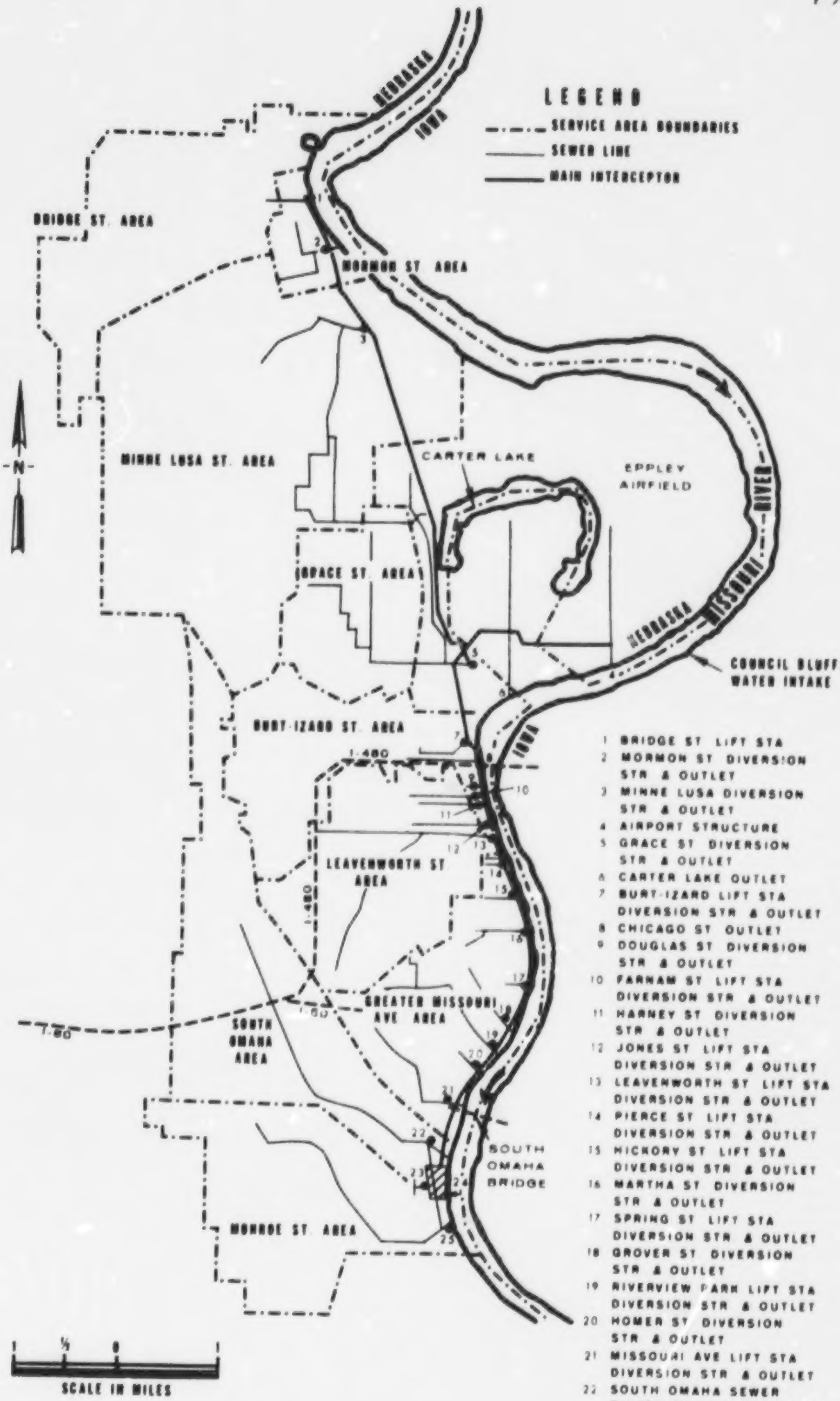

LEGEND
SERVICE AREA BOUNDARIES
SEWER LINE
MAIN INTERCEPTOR
NEBRASKA
IOWA
BRIDGE ST. AREA
MORMON ST. AREA
MINNE LUSA ST. AREA
CARTER LAKE
EPPLEY AIRFIELD
GRACE ST. AREA
MISSOURI RIVER
COUNCIL BLUFFS WATER INTAKE
BURT-IZARD ST. AREA
I-480
LEAVENWORTH ST. AREA
GREATER MISSOURI AVE. AREA
I-80
SOUTH OMAHA AREA
SOUTH OMAHA BRIDGE
MONROE ST. AREA
N
0 ½ 1
SCALE IN MILES
1 BRIDGE ST LIFT STA
2 MORMON ST DIVERSION STR & OUTLET
3 MINNE LUSA DIVERSION STR & OUTLET
4 AIRPORT STRUCTURE
5 GRACE ST DIVERSION STR & OUTLET
6 CARTER LAKE OUTLET
7 BURT-IZARD LIFT STA DIVERSION STR & OUTLET
8 CHICAGO ST OUTLET
9 DOUGLAS ST DIVERSION STR & OUTLET
10 FARNAM ST LIFT STA DIVERSION STR & OUTLET
11 HARNEY ST DIVERSION STR & OUTLET
12 JONES ST LIFT STA DIVERSION STR & OUTLET
13 LEAVENWORTH ST LIFT STA DIVERSION STR & OUTLET
14 PIERCE ST LIFT STA DIVERSION STR & OUTLET
15 HICKORY ST LIFT STA DIVERSION STR & OUTLET
16 MARTHA ST DIVERSION STR & OUTLET
17 SPRING ST LIFT STA DIVERSION STR & OUTLET
18 GROVER ST DIVERSION STR & OUTLET
19 RIVERVIEW PARK LIFT STA DIVERSION STR & OUTLET
20 HOMER ST DIVERSION STR & OUTLET
21 MISSOURI AVE LIFT STA DIVERSION STR & OUTLET
22 SOUTH OMAHA SEWER DIVERSION STR & OUTLET
23 U ST OUTLET
24 TREATMENT PLANT SITE
25 MONROE ST LIFT STA

Figure 4. Sewage Collection for the Missouri River Wastewater Treatment Plant, Omaha, Nebraska 1972

TABLE 5

SERVICE AREAS IN OMAHA, NEBRASKA

Map Key[a]	Name of Service Area	Name of Structure(s)[b] Location in Service Area	Point of Discharge
1	Bridge Street	Bridge Street Lift Station	North Interceptor to Burt-Izard Lift Station
2	Mormon Street	Mormon Street Diversion Structure	North Interceptor to Burt-Izard Lift Station
3	Minne Lusa Street	Minne Lusa Diversion Structure	North Interceptor to Burt-Izard Lift Station
5	Grace Street	Grace Street Diversion Structure	Burt-Izard Lift Station
7	Burt-Izard Street	Burt-Izard Diversion Structure and Lift Station	South Interceptor to MRWWTP North Inlet
8		Chicago Street Diversion Structure	Burt-Izard Lift Station
9		Douglas Street Diversion Structure	Farnam Street Lift Station
10		Farnam Street Diversion Structure and Lift Station	South Interceptor to MRWWTP North Inlet
11		Harney Street Diversion Structure	Farnam Street Lift Station
12		Jones Street Diversion Structure and Lift Station	South Interceptor to MRWWTP North Inlet
13	Leavenworth Street	Leavenworth Street Diversion Structure and Lift Station	South Interceptor to MRWWTP North Inlet
14	Greater Missouri Avenue	Pierce Street Diversion Structure and Lift Station	South Interceptor to MRWWTP North Inlet
15		Hickory Street Diversion Structure and Lift Station	South Interceptor to MRWWTP North Inlet
16		Martha Street Diversion Structure	Hickory Street Lift Station
17		Spring Street Diversion Structure and Lift Station	South Interceptor to MRWWTP North Inlet
19		Riverview Park Diversion Structure and Lift Station	South Interceptor to MRWWTP North Inlet
18		Grover Street Diversion Structure	Riverview Park Lift Station
20		Homer Street Diversion Structure	Riverview Park Lift Station
21		Missouri Avenue Diversion Structure and Lift Station	South Interceptor to MRWWTP North Inlet
22	South Omaha	South Omaha Diversion Structure	MRWWTP In-Plant Lift Station
23		Missouri River In-Plant Lift Station	MRWWTP South Inlet
25	Monroe Street	Monroe Street Diversion Structure and Lift Station	MRWWTP

---

[a] See Figure 4 for location of structure.
[b] Structures are listed, in order, from north to south.

TABLE 6

LIFT STATIONS AND GRIT-REMOVAL FACILITIES
MISSOURI RIVER WASTEWATER TREATMENT PLANT SERVICE AREA
OMAHA, NEBRASKA

AUGUST 1972

Map Key a/	Name	Number of Pumps	Rated Capacity of Each Pump (gpm)	Wet-Weather Design Flow (mgd)	Ratio of Wet-Weather Flow to Design Dry-Weather Flow b/	Location of Grit-Removal Facilities	Percent of Time Lift Station By-Passed c/		Observations During 30 July-5 August 1972 Survey d/
							1970	1971	
1	Bridge Street	2	410	0.58	5:1	Within lift station	23	1	None
3	Minne Lusa	0	0	41.5	5:1	Separate e/	7	0	Approximately 50 gpm being by-passed
7	Burt-Izard	3	17,000	48.5	3:1	Separate	26	36	By-passing occurred for 3 days while grit conveyor bearings were replaced.
10	Farnam Street	3	1,425	4.1	3:1	Separate	18	24	By-passing occurred for 9 days while grit elevator motor was repaired.
12	Jones Street	3	835	2.4	3:1	Within lift station	4	15	By-passing occurred for the entire survey period while elevator chain was repaired.
13	Leavenworth Street	3	12,700	36.6	3:1	Within lift station	40	43	By-passing occurred for the entire survey period while grit conveyor bearings were replaced and grit conveyor motor was repaired.
14	Pierce Street	3	820	1.9	3:1	Within lift station	20	18	By-passing occurred at least 1 day as evident by Rodamine WT dye released in the sewer upstream of the lift station.
15	Hickory Street	3	1,800	5.2	3:1	Within lift station	45	18	By-passing occurred for the entire survey period while the controls on lift pumps were replaced.
17	Spring Street	2	95	0.14	3:1	None		1	Partial by-passing occurred continuously as a result of solids buildup in the diversion structure.
19	Riverview Park	3	1,225	3.5	3:1	Separate	16	9	By-passing occurred for the entire survey due to water-line break. Water is used to cool lift-pump bearings.
21	Missouri Avenue	3	585	1.7	3:1	Separate	19	4	No by-passing was observed.
22	South Omaha	0	0		3:1	Separate f/	18	2	No by-passing was observed.
25	Monroe Street	5	14,000	80	3:1	Within lift station	33	6	Minor (<50 gpm) by-passing was observed continuously during the survey.

---

a/ For location See Figure 4.
b/ The structure with 5:1 ratios are located upstream of Council Bluffs Water Intake.
c/ The data were obtained from City records.
d/ A 6-hour power outage at the Missouri River Wastewater Treatment Plant resulted in the by-passing of all lift stations.
e/ The flow from this grit facility is diverted to the Burt-Izard lift station.
f/ The flow from this grit facility is diverted directly to the Missouri River Wastewater Treatment Plant.

ratio for all other structures downstream from the Council Bluff Intake (e.g., Burt-Izard, Leavenworth, Pierce Street, etc.) is three times the dry-weather design flow. Although these ratios are adequate, the flow records and observations during the survey indicate that wastewater is by-passed at ratios less than three to one.*

Prior to the turn of the century many of the combined sewers serving the City of Omaha were constructed of bricks. These brick-ring sewers are beginning to deteriorate, with the bricks being carried by the wastewater to the grit-removal facilities. These facilities were not designed to remove large material. As a result, the grit facilities and lift pumps are frequently damaged, and the wastewater is by-passed to the Missouri River.

The City is replacing combined sewers on a piece-meal basis. As extensions are added to the combined sewer and as repairs are made to the existing sewers, the City is constructing separate sanitary sewers parallel to the combined sewer being repaired. However, until a combined sewer is separated throughout its entire length (i.e., to the main interceptor), there is little relief offered through this method. The City has no firm plan for separating all combined sewers. City officials are cognizant of the problem, but the cost to implement such separation in the near future is prohibitive.

---

* The estimated dry-weather flow is 38 mgd. The maximum flow reported at the Missouri River plant, from March 1971 to July 1972, was approximately 65 mgd.

During the survey at least 14 mgd of raw sewage was by-passed to the Missouri River due to inoperative lift stations (e.g., Leavenworth, Jones Street, and Hickory Street).

The City of Omaha has 16 employees who are responsible for maintaining and operating the sewerage system. Four of these employees are involved in preventative maintenance of 103 separate facilities.* Based on observations and records of by-passing, inoperative lift stations, grit-removal equipment break downs, etc., there should be additional resources devoted to the maintenance of the system.

Diversion Structures

Three types of diversion structures are employed in this sewerage system. These are: (1) a diversion dam constructed in the sewer line (when the water level exceeds the height of the dam, excess flow is by-passed to the river); (2) a double-pipe arrangement with the diversion pipe being installed at a lower elevation than the by-pass pipe (when the flow in the sewer exceeds the capacity of the diversion pipe, flow is by-passed to the river); and (3) a hydraulic gate which controls the direction of the flow. The gates are operated by use of a level sensing bubbler-tube control system. When the flow exceeds the design wet-weather flow, the gate automatically closes, and all wastes are discharged to the river. The gates can also be closed from a remote position (the Missouri River WWTP).

---

* These 103 facilities not only include the Missouri River WWTP and sewerage system but also five treatment plant and collection systems.

Visual inspections of several diversion structures were made by EPA personnel on 11 August 1972. The Homer Street and Grover Street structures were by-passing the entire wastewater flow (estimated at 1.5 mgd) to the river. This by-passing was caused by the build-up of solids in front of the pipes leading to the pump station. Solids had also built up in the Spring Street, Harney Street, and Douglas Street structures. As a result, partial by-passing of wastewater to the river was observed in these diversion structures.

Grit-Removal Facilities

Monroe Street [25], South Omaha [22], and Minne Lusa Facilities [3]* - Grit removal at these three facilities is accomplished by diverting the wastewater flow into an open concrete basin. [Monroe Street has two such basins operated in parallel.] Diffused air, added in the basin, keeps organic material from settling with the grit. Settled grit is removed by means of a clam shell mounted on a moveable crane and then is hauled to a landfill.

Maintenance of these three facilities is adequate, and operational problems are minimal. Generally, by-passing of these grit facilities [Table 6] results from operational problems at the lift stations (i.e., pumps out of service for repair). During the survey flows of 50 gpm or less were observed being discharged to the river from both the Monroe Street and Minne Lusa Diversion Structures. This small flow is assumed to result from leakage under the hydraulic diversion gates.

---

* [Number in brackets refer to location of facility as shown on Figure 4.]

Missouri Avenue [21], Riverview Park [19], Farnam Street [10], and Burt Izard [7] Facilities - At these sites the grit-removal facility is located in the sewer line between the diversion structure[*] and the lift station. At each location the flow passes through an aerated chamber where grit settles out and is carried by a screw conveyor into a grit sump. The grit is continuously removed by a bucket elevator, washed, and stored in a pit outside and adjacent to the facility.

Continual operational problems have been experienced with the grit conveyor system at each of these facilities. Operational problems result from broken chains and buckets on the elevator; jammed or broken screw conveyors; and failure of bearings.[**] As a result, the entire flow from each service area is by-passed to the Missouri River. City records indicate that from 1970 to 1971 the frequency of by-passing at the Farnam Street and Burt-Izard facilities increased [Table 6].

During the survey the Farnam Street Lift Station was out of service from 1 August to 9 August, by-passing an estimated 1.5 mgd; Burt-Izard Lift Station from 4 August to 6 August, by-passing an estimated 12 mgd; and Riverview Park Lift Station from 30 July to 12 August, by-passing an estimated 1 mgd.[***] Except for Riverview, these facilities were out of service as a result of problems associated with the grit-removal equipment. Riverview Park Lift Station was by-passing wastewater because of a broken pipe that supplies cooling water for the lift-pump bearings.

---

[*] Except for the Missouri Avenue facility, each grit-removal facility receives wastewater from more than one diversion structure [Table 5].

[**] Large pieces of material (e.g., bricks, lumber, rocks, pieces of metal, etc.) that enter the grit chamber and cannot be removed by the grit equipment are responsible for most of the failures.

[***] During the days when these stations as well as Leavenworth were down at least 26 mgd of raw sewage was by-passed.

Burt-Izard, the largest of these facilities (14 mgd dry-weather flow), requires from two to three weeks to be repaired. A complete set of spare parts for this facility is maintained by the City in order to reduce the period of by-passing. City officials have planned modifications of this facility with a scheduled completion date of 31 December 1974. The modifications, recommended by Kirkham, Michael and Associates,[7] consist of replacing the grit conveyor system with an overhead crane and clam-shell bucket similar to the one used at the Minne Lusa facility. An additional grit-removal and storage facility will be constructed on the North Interceptor between the Grace Street Diversion Structure and the Burt-Izard Lift Station. This new facility, also a grit-chamber-clam-shell bucket type, is designed to reduce the grit load presently received from the North Interceptor. These modifications will reduce the frequency of by-passing from the Burt-Izard facility. However, the scheduled completion date can only be met if funds are available. A grant application for construction of the new grit facilities has been submitted to the Nebraska Department of Environmental Control, but no grant funds will be available until at least FY 1975.

City officials should also modify the Missouri Avenue, Riverview Park, and Farnam Street grit facilities. Modification of these (i.e., replacing grit conveyor system with a overhead crane and clam-shell) facilities would reduce the frequency of by-passing wastewater to the Missouri River.

Hickory Street [15], Pierce Street [14], Leavenworth Street [13], Jones Street [12], and Bridge Street [1] Facilities - Each of these grit-removal facilities are located within the lift-station wet well. Grit settles out in the wet well and is carried by a screw conveyor, located in the center of the well, to a sump. The grit in the sump is removed by a bucket elevator, washed, and transported by a second screw conveyor to a storage pit located outside and adjacent to the facility.

Operational records show that this grit-removal system is the least reliable of all three types [Table 6]. Waste flows from service areas with large loads of grit (i.e., Pierce Street and Leavenworth Street) result in the breakdown of conveyors and bucket elevators, thus requiring city personnel to remove grit manually from the facility. The physical separation between the bottom of the lift-pump intakes and the top of the grit conveyor is limited. As grit (including bricks, posts, reinforcing bar, large rocks, etc.) is transported by the conveyor, the pump impellers pick up the grit and are damaged. Wastewater flows are then by-passed until the pumps can be repaired.

During the survey, wastewater was by-passed continuously from the Hickory Street, Jones Street, and Leavenworth Street facilities (estimated at 14 mgd). Grit-removal equipment was being repaired in Jones Street and Leavenworth. Pump controls were inoperative at the Hickory Street facility. Of further interest is that Rhodamine WT dye released in the Pierce Street sewer revealed by-passing of the lift station was occurring, although operational problems during the period of the survey were not reported by the City.[11/]

Kirkham, Michael and Associates[7/] have recommended constructing a new grit-removal facility for the Leavenworth Street Sewer. The new facility, which would be located approximately 800 ft upstream from the lift station, would consist of an aerated grit chamber employing an overhead crane and clam-shell bucket to remove grit. This facility is intended to reduce the frequency of by-passing wastewater from this service area. City officials have scheduled a completion date of 31 December 1974. However, the funding difficulties faced on this project are similar to those encountered for the Burt-Izard facility.

New grit-removal facilities should also be constructed for the Hickory Street, Pierce Street, Jones Street and Bridge Street Stations in order to reduce the frequency of by-passing.

Lift Stations

The lift stations each have a wet well to facilitate collection of wastewater so that it can be pumped into the interceptors — with the exception of Monroe Street Lift Station which pumps directly to the Missouri River Wastewater Treatment Plant. Each station is equipped with a bar screen, barminutor or comminutor, and variable speed pumps. Downstream from the Council Bluffs Water Intake (RM 618.8) the pumping capacity at each lift station is three times the design dry-weather flow; it is five times the design dry-weather flow upstream of the intake [Table 6].

Pump controls are arranged so that all pumps, except one, can operate at one time. The remaining pump is for emergency standby to be used in case of a pump failure. The variable-speed motors are controlled by the depth of water in the wet well. As the depth of the water increases, the speed of the motor (i.e., pumping capacity) increases. As the pump capacity reaches a preset value, additional pumps start and operate in the same manner.

The variable-speed motors are of the slip-ring (rotor) type. These rings are subject to excessive wear, electrical arcing, and electrical surges. Because of these and other problems, by-passing of all waste flow occurs frequently [Table 6]. An alternate type of pumping system should be investigated by the City of Omaha to determine whether these pumps can be either modified or replaced to reduce or eliminate operational problems.

In summary, the Omaha sewerage system has a history of operational problems associated with the failure of grit-removal equipment (e.g., broken buckets and conveyors, failure of bearings, etc.) which lead to the by-passing of large quantities of raw sewage to the Missouri River. City maintenance records show that to repair the large grit facilities, Burt-Izard and Leavenworth, a minimum of two weeks is required. During these frequent and protracted periods, raw sewage is by-passed to the Missouri River.

The Burt-Izard and Leavenworth facilities have dry-weather flows of approximately 26 mgd. The city has scheduled modification of the grit-removal facilities at Burt-Izard and Leavenworth. These modifications are to include replacment of the present equipment with overhead cranes and clam-shells and are intended to reduce the frequency of by-passing.

There are no plans at present to replace or improve grit-removal facilities at the remaining locations. Thus, dry-weather by-passing of raw sewage during periods of equipment failure can be expected to continue indefinitely

Further, there are no plans, at this time, to proceed with a general improvement program to replace the deteriorating brick sewers and to separate storm and sanitary sewage. In the absence of such a program maintenance of grit-removal facilities and lift stations will continue to be a difficult problem and to be the cause of by-passing of raw sewage; and combined storm and sanitary sewage will continue to be by-passed during wet-weather. Operational difficulties resulting from combined wet-weather flows will hamper improved treatment at the Missouri River Wastewater Treatment Plant.

VI. STREAM SURVEYS

During the period 31 July through 11 August 1972, EPA personnel obtained water-quality data at selected locations on the Missouri River from downstream of Allied Chemical Corporation (RM 595.2) to upstream of the Union Pacific Shops (RM 616.2); Little Papillion Creek from downstream of Flinn Paving Company asphalt plant (RM 596.60/8.30/5.42/1.70) to upstream of the plant (RM 596.60/8.30/5.42/1.80); Big Papillion Creek from Harrison Street (RM 596.60/8.30/4.16) to Q Street (RM 596.60/8.30/4.82); and Papillion Creek from near the mouth (RM 596.6/1.0) to upstream of National By-Products, Inc. (RM 596.6/2.5). [Results of field measurements, and chemical and bacteriological analyses are provided in Tables 7, 8, and 9.]

A. LITTLE PAPILLION CREEK

Little Papillion Creek has been classified by the State of Nebraska as a Class C water designated for agricultural and industrial uses, partial body-contact sports, and growth and propagation of fish and wildlife. The creek upstream of Flinn Paving Company asphalt plant contained 36 mg/l of suspended solids. As a result of the asphalt plant discharge, the concentration of suspended solids increased to 380 mg/l. Sediment deposits blanketed the stream bed downstream from the discharge; the increase in turbidity was noticeable for approximately 1/2 mile downstream. Violations occurred of the specific suspended solids standard C-3* which reads

---

* This notation refers to Parameter 3 for a Class C water in the State of Nebraska water quality standards. [Appendix A.]

TABLE 7

SUMMARY OF FIELD MEASUREMENTS AND ANALYTICAL DATA
LITTLE PAPILLION CREEK, BIG PAPILLION CREEK, PAPILLION CREEK, AND THE MISSOURI RIVER

31 July - 11 August 1972[a]

Map Key[b]	Station Description	Dates	Flow cfs Avg	pH Range	Conductivity µmhos/cm Range	Temp. °C Range	DO Range	DO % Sat Range	BOD		COD		TOC		Suspended Solids		Oil & Grease[c]	
									Range	Avg	Range	Avg	Range	Avg	Range	Avg	Range	Avg
1.	Little Papillion Ck., upstream of Flinn Paving Co. (RM 596.60/8.30/5.42/1.80)	8/7-9		7.3-9.0	400-700	13-23									30-40	36		
2.	Little Papillion Ck., downstream from Flinn Paving Co. (RM 596.60/8.30/5.42/1.70)	8/7-9		7.4-8.8	425-625	14-22									234-528	380		
3.	Big Papillion Ck., upstream of Papillion WWTP (RM 596,6*/8.30/4.82)	8/7-10		7.4-8.7	500-650	15-21	5.6-9.2	58-94										
4.	Big Papillion Creek downstream from Papillion Creek WWTP (RM 596.60/8.30/4.16)	8/7-10		6.9-7.4	650-850	16-21	1.2-4.4	13-50										
5.	Papillion Creek, upstream of National By-Products, Inc. (RM 596.6/2.5)	7/31-8/5	90	6.5-7.8	280-800	18-24	0.2-0.4	2-6	25-40	30					48-76	62	2-6	4
6.	Papillion Ck., downstream from National By-Products, Inc., near the mouth (RM 596.6/1.0)	7/31-8/5	115 (est)	6.4-7.9	400-800	19-25	0.0-0.1	0-1	30-60	45	74-83	79	22-23	22	32-58	49		520[f]

TABLE 7 (Cont.)

SUMMARY OF FIELD MEASUREMENTS AND ANALYTICAL DATA
LITTLE PAPILLION CREEK, BIG PAPILLION CREEK, PAPILLION CREEK, AND THE MISSOURI RIVER
31 July - 11 August 1972[a/]

Map Key[b/]	Station Description	Dates	Flow cfs Avg	pH Range	Conductivity µmhos/cm Range	Temp. °C Range	DO Range	DO % Sat Range	BOD Range	BOD Avg	COD Range	COD Avg	TOC Range	TOC Avg	Suspended Solids Range	Suspended Solids Avg	Oil & Grease[c/] Range	Oil & Grease[c/] Avg
7.	Missouri River, upstream of Union Pacific Shops (RM 616.2)	8/10-12	52,100	8.2-8.6	675-725	24[d/]											1-5	3
8.	Missouri River downstream from Union Pacific Shops (RM 616.1)	8/10-12	52,100 (est.)	8.3-8.6	650-700	24-25											2-11	5
9.	Missouri River, upstream of Missouri River WWTP (RM 611.87)	7/31-8/5	52,100 (est.)	8.0-9.0	580-750	23-25	7.0-8.6	85-102										
10.	Missouri River, downstream from Missouri River WWTP (RM 611.42)	7/31-8/5	52,200 (est.)	6.6-8.6	580-800	23-25	7.2-7.9	88-98										
11.	Missouri River upstream of Papillion Creek (RM 596.68)	7/31-8/5	52,300[e/]	7.5-8.3	650-720	23-25	7.3-7.9	88-96									6-9	8
12.	Missouri River, downstream from Papillion Creek (RM 596.47)	7/31-8/5	52,400 (est.)	7.1-8.2	660-750	23-25	4.8-5.4	58-67									790-3100	1900
13.	Missouri River, upstream of Allied Chemical Corp. (RM 595.32)	8/7-11	52,400 (est.)	6.8-8.6	380-750	20-26					23-89	45	5-10	7	102-172	138		
14.	Missouri River, downstream From Allied Chemical Corp. (RM 595.20)	8/7-11	52,500 (est.)	6.9-9.0	380-750	20-25					21-74	42	5-7	6	59-133	99		

---

a/ All units are in mg/l unless otherwise noted.
b/ See Figures 2 and 3.
c/ This is hexane-extractable material.
d/ All values were the same.
e/ Flow data were provided by USGS Water Resources Division, Council Bluffs, Iowa.
f/ Data consist of a single value.

TABLE 8

RESULTS OF BACTERIOLOGICAL ANALYSES
MISSOURI RIVER AND PAPILLION CREEK
31 July - 5 August 1972

Description	Total Coliform Count/100 ml			Fecal Coliform Count/100 ml			Fecal Streptococci Count/100 ml		
	Minimum	Log Mean	Maximum	Minimum	Log Mean	Maximum	Minimum	Log Mean	Maximum
Missouri River, upstream of Missouri River WWTP (RM 611.87)	24,000	79,000	160,000	1,000	4,100	8,000	630	2,400	6,200
Missouri River, downstream from Missouri River WWTP (RM 611.42)	25,000	450,000	2,000,000	1,400	57,000	390,000	1,200	>14,000	>100,000
Missouri River, upstream of Papillion Creek (RM 596.68)	66,000	130,000	230,000	4,500	11,000	19,000	2,800	6,300	9,000
Missouri River, downstream from Papillion Creek (RM 596.47)	580,000	1,400,000	4,300,000	35,000	65,000	140,000	6,800	17,000	24,000
Papillion Creek, upstream of National By-Products effluent (RM 596.6/2.5)	6,200,000	>10,000,000	23,000,000	250,000	790,000	2,900,000	37,000	130,000	580,000
Papillion Creek, near mouth (RM 596.6/1.0)	7,900,000	15,000,000	26,000,000	260,000	800,000	2,300,000	34,000	93,000	200,000

TABLE 9

SUMMARY OF HEAVY METAL AND NUTRIENT DATA AT SELECTED STATIONS ON THE MISSOURI RIVER

7 - 11 August 1972

Parameter[a]	Missouri River, upstream of Allied Chemical Corporation (RM 595.32)	Missouri River, downstream of Allied Chemical Corporation (RM 595.2)
Zinc	0.155-0.249	0.178-0.198
Copper	0.022-0.066	0.015-0.067
Cadmium	0.010-0.015	0.005-0.015
Total Kjeldahl-Nitrogen	0.55-0.93	1.20-6.25
Ammonia-Nitrogen	<0.01-0.06	0.42-2.37
Organic Nitrogen	0.55-0.92	0.78-4.69
NO_3 + NO_2- Nitrogen	0.36-0.47	0.47-1.08
Total Phosphorus	0.09-0.15	0.11-0.18

[a] All values are expressed as mg/1.

"none from wastewater sources which will permit objectionable deposition or be deleterious for the designated uses ..." and of general water quality criteria (i.e., "... waters shall be free of substances attributable to discharges ... that will form objectionable deposits ... color ... or turbidity ...").

B. BIG PAPILLION CREEK

Big Papillion Creek, a Class C water, was relatively unpolluted upstream of the Papillion Creek Wastewater Treatment Plant. The water quality of the Creek was degraded by the plant wastewater which contained average loads of 28,800 lb of BOD and 42,800 lb of suspended solids. In Big Papillion Creek this discharge markedly affects the DO that ranged from 5.6 to 9.2 mg/l (58 to 94 percent saturation) upstream (RM 8.30/4.82) then decreased to a range of 1.2 to 4.4 mg/l (13 to 50 percent saturation) downstream (RM 8.30/4.41) from the treatment plant discharge [Table 7]. Visual observations revealed a significant increase in the turbidity of the water and floating solids and grease. These conditions violate sections C-3 (turbidity and solids); C-6 (dissolved oxygen criteria); C-9 (oil and grease) and C-10 (aesthetic considerations) of the Nebraska Water Quality Standards [Appendix A].

C. PAPILLION CREEK

Papillion Creek, a Class C water, receives flow from numerous tributaries including Big Papillion and Little Papillion Creeks, and empties into the Missouri River at RM 596.6.

At the upstream station (RM 596.6/2.5) the stream was a gray color and contained an average of 30 mg/l BOD, 62 mg/l suspended solids, and 4 mg/l oil and grease. All concentrations of DO measured were less than 1 mg/l [Table 7]; total- and fecal-coliform bacterial densities were greater than 10,000,000 and 790,000/100 ml, respectively [Table 9]. Violations of DO standards (section C-6) bacterial standards (section C-1) and General Water Quality Criteria occurred at this station.

At the time of the survey Papillion Creek was grossly polluted near the mouth (RM 596.6/1.0). The BOD, suspended solids, and DO concentrations, and total- and fecal-coliform bacterial densities were similar to those observed at the upstream Papillion Creek station. As a result, the creek flow (115 cfs) entering the Missouri River contained a daily waste load of 41,600 lb of BOD, 47,000 lb of suspended solids, and total- and fecal-coliform bacterial densities of 15,000,000 and 800,000/ml. The oil-and-grease concentration (520 mg/l) significantly increased. Grease balls from National By-Products were visible in the discharge, at the mouth of Papillion Creek, and in the Missouri River.

Rhodamine WT dye was introduced into the effluent in order to trace the dispersion of wastewater from National By-Products, Inc., into Papillion Creek and the Missouri River. Samples were collected immediately upstream of the discharge to determine background fluorescence and oil-and-grease concentrations. Samples were also collected immediately downstream of the discharge when the dye was introduced: using fluorometric techniques, the dye was traced to the mouth of Papillion Creek and into the Missouri River downstream from the creek.

Results indicated that the discharge from National By-Products increased the oil-and-grease concentration on the surface of the Missouri River from 9 mg/l or less upstream of the mouth of Papillion Creek, to 790 mg/l or more, downstream. Grease balls were visible at the downstream station. The downstream water-quality conditions are in violation of the Nebraska Water Quality Standards (Section A-9, no globules of grease shall be present, and emulsified oil and grease shall be less than 10 mg/l) [Appendix A].

D. MISSOURI RIVER

The flow of the Missouri River is controlled by six large reservoirs located between its headwaters and Yankton, South Dakota.[6/] The river in the Omaha area has been levied for flood control and channelized for navigation. During the survey the average flow observed in the Missouri River at Bellevue, Nebraska (RM 601.3), was 52,200 cfs.*

The DO concentrations in the Missouri River upstream of the Missouri River Wastewater Treatment Plant (RM 611.87) ranged from 7.0 to 8.6 mg/l (85 to 102 percent saturation) [Table 7]. The total- and fecal-coliform bacterial levels were 79,000 and 4,100/100 ml, respectively. These high bacterial levels are believed to be a direct result of raw-sewage by-pass from the Leavenworth and other lift stations [Table 8] and cause violations of the Nebraska Water Quality Standards. The Missouri River Wastewater Treatment Plant which provides no disinfection, discharged an effluent containing an average of 99,100 lb/day of BOD; 93,300 lb/day, suspended solids; 125 mg/l of oil and grease: and a fecal-coliform bacteria density of 17,000,000/100 ml. The effects of the plant discharge were measured downstream in the Missouri River (RM 611.42). Although the DO remained essentially the same (7.2 to 7.9 mg/l), the total- and fecal-coliform bacterial densities had increased to 450,000 and 57,000/100 ml, respectively [Table 8]. The bacterial densities discharged sustained the water-quality standards violation.

---

* Flow data were provided by USGS Water Resources Division, Council Bluffs, Iowa.

Papillion Creek joins the Missouri River at RM 596.6. Despite the flow dilution provided by the Missouri River, the effect of the waste load in Papillion Creek is reflected in the river downstream from the confluence of the two streams. The dissolved oxygen (5 mg/l), oil and grease (10 mg/l), and bacterial density (65,000/100 ml), [Table 8] all violated the Nebraska Water Quality Standards [Appendix A].

Allied Chemical Corporation, Agriculture Division, discharged wastes into the Missouri River at RM 595.26. The effluent contained high concentrations of oil and grease (27 to 1,100 mg/l), ammonia-nitrogen (70.8 to 82.2 mg/l), total Kjeldahl nitrogen (100 to 116 mg/l), and of copper

(0.047 to 0.244 mg/l).* As a result of the discharge the total Kjeldahl nitrogen and ammonia-nitrogen (NH_3-N) concentrations increased significantly in the Missouri River [Table 9]. The increase in NH_3-N concentrations which ranged from 0.01 to 0.06, upstream of the discharge (RM 595.32), and from 0.42 to 2.37 downstream (RM 595.20), violated the Nebraska Water Quality Standards.

In summary, the discharges from the Missouri River Wastewater Treatment Plant and Allied Chemical Corporation and the waste inflow from Papillion Creek cause violations of the Water Quality Standards established by the State of Nebraska for the Missouri River for DO, bacteria, NH_3-N, and oil and grease. Observed copper concentrations exceeded the recommended limits specified by the National Technical Advisory Committee.

---

* The Nebraska Water Quality Standards do not specify a limit for copper in waters classified as fisheries. The report of the National Technical Advisory Committee (NTAC)[12/] recommends the following criteria for copper in freshwater. "The maximum copper (expressed as Cu) concentration (not including copper attached to silt particles or in stable organic combination) at any time or place should not be greater than 1/10th the 96-hour TL_m value nor should any 24-hour average concentration exceed 1/30 of the 96-hour TL_m." A 96-hour TL_m of 0.47 mg/l has been reported for fathead minnows.[13/] The levels observed in the Missouri River as a result of the Allied Chemical Corporation discharge exceeded the NTAC recommendation.

VII. STATUS OF WATER POLLUTION ABATEMENT

A. PAST AND PRESENT ABATEMENT ACTIONS

As mentioned previously, an Enforcement Conference was held 14 June 1957 on the Matter of Pollution of the Missouri River. Several specific recommendations for pollution control in the Omaha, Nebraska, area were made. These recommendations along with the action taken, are summarized in the following paragraphs.

All municipalities and industries along the Missouri River were to provide adequate wastewater treatment (primary implied), with the City of Omaha to commence construction no later than 1 January 1960. However, satisfactory treatment was not in operation when the second session of the conference convened 21 July 1964.

At this second session the conferees accepted the proposal by the City for construction of a pretreatment plant (i.e., the Central Wastewater Treatment Facility). This pretreatment facility was to be in operation by 15 December 1966 after which time all wastes discharged to the Missouri River from Omaha were to receive a minimum of primary treatment.

Progress evaluation meetings were subsequently held in February 1965, January and March 1966, and March 1967 to discuss effluent requirements for the pretreatment facility. It was recommended that the influent to the Missouri River Wastewater Treatment Plant not exceed 400 mg/l of suspended solids and that the oil-and-grease load not exceed 18,000 lb/day at the south inlet (i.e. the point at which the Central Wastewater Treatment Facility discharge would enter the Missouri River plant).

In spite of the conference recommendations--that the Central Wastewater Treatment Facility be in operation by 15 December 1966 and that no wastes be discharged to the Missouri River without at least primary treatment, the pretreatment facility did not commence operation until 1970, or almost four years later. In the interim, the packing house wastes flowed directly to the south inlet of the Missouri River plant, and because the capacity of the latter was exceeded, these wastes were by-passed directly to the river, an obvious violation of the conference recommendations.

Pursuant to the Federal Water Pollution Control Act of 1965 the State of Nebraska established water quality standards and an implementation plan for pollution abatement. Standards were established for the Missouri River and tributaries in the Omaha area. Big Papillion, Little Papillion, West Papillion, and Papillion Creek all received Class C designations [Appendix A]. Under the 1972 Amendments the Standards for the tributary streams will become Federal Standards when accepted.

Specific compliance dates established by Nebraska and the present status of compliance are summarized in the following:

1. All municipal, industrial, and other waste sources that discharge into intrastate and interstate waters except for those waste sources discharging directly into the Missouri River shall be in compliance* by 1 January 1972. Waste sources in the Omaha area to which this requirement applies are:

Industrial Sources	Remarks
Flinn Paving Company	Not in compliance
National By-Products, Inc.	Not in compliance

---

* All municipal wastes shall receive at least secondary treatment plus such additional treatment as is required to maintain Water Quality Criteria, as set forth in these Standards. All other wastes shall receive an equivalent degree of treatment or control consistent with waste characteristics, uses, and quality of receiving waters.

Municipal Sources	Remarks
Bellevue Plant No. 2*	Not in compliance. About one-half of waste water receives secondary treatment. No disinfection.
District 31 Plant*	Not in compliance. Secondary treatment plant is hydraulically and organically overloaded. No disinfection.
Holling Heights Plant*	Adequate secondary treatment (17 mg/l BOD and suspended solids) but no disinfection.
Jacobson Plant*	Not in compliance. Inadequate secondary treatment and no disinfection.
LaVista Plant*	Not in compliance. Secondary treatment plant is hydraulically overloaded. No disinfection.
Oak Hills Plant*	Secondary treatment adequate (20 mg/l BOD and 28 mg/l suspended solids) but no disinfection.
Offutt Air Force*	Not in compliance. Secondary treatment inadequate. Status of disinfection unknown.
Papillion Creek Plant	Not in compliance. Secondary treatment for less than one-half of waste flow. No disinfection.

2. All municipal, industrial, and other waste sources discharging to the Missouri River shall be in compliance by 31 December 1975. Waste sources in the Omaha area to which this requirement applies are:

Industrial Sources	Remarks
Allied Chemical	Permit application filed with EPA. No treatment proposed by company. Present discharge violates water quality standards.
Union Pacific Railroad Company	In compliance with requirements.

---

* Plants to be abandoned and connected to a new Papillion Creek WWTP by 31 December 1972.

Municipal Sources	Remarks
Missouri River Wastewater Treatment Plant	Presently provides inadequate primary treatment. Secondary treatment planned for completion by 31 December 1975. Contingent on adequate Federal and state funding support (i.e., 80 percent).

In addition to the above, the Nebraska Standards also cover pollution from combined sewer overflows with the following statement:

> Combined sewer overflows are recognized as a source of objectionable pollutants in many of the older sewer systems. It is hoped that through some of the Federal aid programs that the problem of combined sewer overflows will be researched and a solution provided by 31 December 1977. In the meantime, it is the policy of the Nebraska Water Pollution Control Council to encourage the separation of storm and sanitary sewers and to disapprove any extension of combined sewers.

The City of Omaha experiences continual problems with combined sewers. By-passing from the larger sewers (e.g., Burt Izard and Leavenworth) has occurred more than 25 percent of the time during the past two years. Because of heavy solids, debris, etc., carried through these sewers, breakdowns occur at lift stations and in grit chambers. During the recent EPA survey at least 14 mgd of raw sewage wastes were by-passed daily to the Missouri River during dry-weather flow, constituting violations of the Nebraska Water Quality Standards and of the conference recommendations that all wastes discharged to the Missouri River receive primary treatment by 15 December 1966.

In the enforcement of its water quality criteria and other pollution control regulations, procedures for abatement actions as stated in the Water Quality Standards [Appendix A] include:

1. An informal conferance with the person or persons responsible for the violation;
2. Formal hearing; and
3. Court action where necessary.

To date, the State has held no formal hearings or pursued any court action against polluters in the Omaha, Nebraska, area. This apparent reluctance to pursue enforcement action possibly stems from the lack of adequate State and Federal funding, in the case of municipal pollution abatement, and of a clear definition of "equivalent secondary treatment," in the case of industrial abatement. With the passage of the 1972 Amendments to the Water Pollution Control Act the States have a clearly defined course of action to pursue.

The City of Omaha has an ordinance [Appendix G] regulating the quantity and quality of discharges to municipal treatment systems. An industrial waste surveillance and control program is currently in existence. This program is directed toward regulating the discharge of industrial wastes to the municipal plants that could damage the conveyance system or impair the efficiency of treatment facilities. At the time of the survey, limited enforcement of this ordinance was being pursued. However, City officials indicated that a more viable program was being initiated. Changes in this ordinance could be necessary, pursuant to the pretreatment requirements to be promulgated under the 1972 Amendments to the Water Pollution Control Act.

Until the new Papillion Creek plant can be constructed, interim abatement measures have been proposed by Omaha to alleviate some of the inadequate treatment problems at several of the small plants [Table 1]. These measures include a) expansion of the Jacobson plant,

b) diverting excess flows from the District 31 plant to the Jacobson plant, and c) installation of chlorination at the Jacobson and District 31 plants.

City officials are cognizant of the problems associated with the combined sewers. Complete separation of the storm water from the sanitary sewers would be a massive undertaking and, according to the estimate of one City official, it would cost at least 250 million dollars. The City is currently undertaking separation on a piece-meal basis, e.g., when a section of combined sewer is repaired a parallel sewer is laid to carry the sanitary wastes. However, this procedure will not provide relief in the interceptor system until the entire length of a combined sewer is separated. A concerted effort to accomplish the latter throughout the city is badly needed but is not being actively pursued at this time.

B. POLLUTION CONTROL REQUIREMENTS OF THE FWPCA AMENDMENTS OF 1972

The Federal Water Pollution Control Act Amendments of 1972 require EPA to promulgate standards, guidelines, and regulations that will implement many of the enforceable requirements of the Act. Most important are the limitations on the quantity and quality of effluents which may be discharged into any water of the Nation. All point sources of pollution (including Federal facilities), other than publicly owned treatment works, that discharge directly into the navigable waters (defined as the "waters of the United States including the territorial seas") are required to achieve, not later than 1 July 1977, effluent limitations that shall require the application of the *best practicable control technology* currently available, as determined by the EPA. Not later than 1 July 1983 the same point sources must achieve effluent limitations that shall require the application of the *best available technology economically achievable*.

Industries, including Federal facilities, discharging into publicly owned treatment works must comply with pretreatment standards which are to be promulgated by the EPA.

Publicly owned treatment works must meet, by 1 July 1977, effluent limitations that are based on *secondary treatment*, and by July 1, 1983, *the best practicable waste treatment technology*.

The 1972 Amendments provide for the continuation of the framework of State water quality standards required under the Water Quality Act of 1965. In addition, water quality standards applicable to intrastate waters must be submitted to the EPA within a required time frame. In every case, the promulgated effluent limitations must be sufficiently stringent to maintain water quality, as prescribed by the standards. Authority is reserved to each State to impose effluent limitations more stringent than those required by the EPA where the State deems such action necessary to meet its own State water quality standards.

National Standards of Performance must be prescribed by EPA that require effluent limitations for new sources of pollution reflecting the best available demonstrated control technology, including where practicable, no discharge of pollution.

Effluent standards must also be established for the control of toxic pollutants. Pretreatment standards must be met by industrial waste sources discharging to publicly owned treatment works.

The discharge of any pollutant by any person is unlawful unless permitted under the National Pollutant Discharge Elimination System (Permit Program). The EPA is authorized to issue permits for the discharge of pollutants. The issuance of permits is a practical device whereby the various effluent limitations, standards, and other requirements of the Act are actually applied to individual sources of pollution. The Permit Program (NPDES) established under the 1972 Amendments, supplants the permit program previously established pursuant to Section 13 of the Rivers and Harbors Act of March 3, 1899.

The EPA must establish guidelines within which the separate States must operate their permit programs if they desire to assume this responsibility. Each State program must be approved by EPA and is subject to assumption of operation by EPA if the State does not administer the program consistent with the 1972 Act. When a State permit program has been approved by the EPA, the State becomes the permit-issuing authority for sources within its jurisdiction, and the EPA ceases to issue permits within that State. EPA, however, retains a permit-by-permit veto power in cases where a State permit does not conform to the guidelines and requirements of the law or where waters of a State downstream are being polluted by a permitted effluent discharge in another State upstream. Violations of the conditions (effluent limitations compliance schedules, etc.) of a permit issued by the Administrator or by a State pursuant to the NPDES are subject to enforcement.

Enforcement prerogatives are available to the EPA when any person violates Effluent Limitations, Water Quality-Related Effluent Limitations, National Standards of Performance, Toxic and Pretreatment Effluent Standards, Inspection and Monitoring Requirements. or any permit condition including compliance schedules.

The present pollution abatement regulations of the State of Nebraska partially fulfill the requirements of the 1972 Amendments. Actions necessary to comply with the Amendments include:

1. The enactment of State legislation providing the pollution control agency permit issuing authority under the NPDES program;
2. Federal approval of water-quality criteria presently established for intrastate streams in the Omaha area;
3. The requirement that all publicly owned treatment works provide secondary treatment as defined by EPA of all wastes discharged to the Missouri River and its tributaries by no later than 31 December 1975;
4. The requirement that the best practicable control technology currently available be applied to all industrial waste discharges to the Missouri River and its tributaries by no later than 31 December 1975;
5. The requirement that industrial wastes, discharged to publicly owned treatment works, be pretreated in order to remove toxic

substances to levels that will not inhibit treatment of the combined wastes or pass through the public system in concentrations which are deleterious to the established uses of the receiving waters.

6. Revision of toxicity provisions of present Board Resolutions in order to conform with the requirements of Sections 307 and 502(13) of the 1972 Amendments and of the list of toxic substances which is to be promulgated by EPA.

Detailed requirements for approval of State permit programs are contained in the Federal Register, Volume 37, Number 247, "State Program Elements Necessary for Participation in National Pollution Discharge Elimination System," published 22 December 1972.

Federal activities discharging wastewaters directly to the receiving water must conform to the requirements for best practicable control technology by 1 July 1977, best available technology economically achievable by 1 July 1983, and the pretreatment provision applicable to industrial wastewater discharges.

REFERENCES

1. *Summary of Conference on Pollution of Interstate Waters of the Missouri River -- Omaha, Nebraska, Area.* U. S. Department of Health, Education, and Welfare, Public Health Service. Kansas City, Missouri. June 1957.

2. *Summary of Conference (Second Session) on Pollution of Interstate Waters -- of the Missouri River in the Omaha, Nebraska, Area (Nebraska, Iowa, Missouri, Kansas).* U. S. Department of Health, Education, and Welfare, Public Health Service, 21 July 1964.

3. *Summary of Progress Evaluation Meeting of Conferences on Pollution of the Interstate Waters of the Missouri River in the Omaha, Nebraska Area (Nebraska, Iowa, Missouri, and Kansas).* U. S. Department of Health, Education, and Welfare. Federal Water Pollution Control Administration. Kansas City, Missouri. 11-12 February 1965.

4. *Progress Evaluation Meetings of Conferences in the Matter of Pollution of the Interstate Waters of the Missouri River -- Omaha Area.* U. S. Department of Health, Education, and Welfare. 27 January and 29 March 1966.

5. *Progress Evaluation Meeting in the Matter of Pollution of Interstate Waters of the Missouri River, Omaha, Nebraska, Area.* U. S. Department of Interior, Federal Water Quality Administration. 8 March 1967.

6. *Everyone Can't Live Upstream, A Contemporary History of the Water Quality Problems on the Missouri River (Sioux City, Iowa, to Hermann, Missouri).* Environmental Protection Agency, Office of Water Programs, Kansas City, Missouri. April 1971.

7. *Study and Report on Post-primary Treatment, Missouri River Plant, Omaha, Nebraska.* Kirkham, Michael and Associates, March 1972.

8. Telephone Conversation with Mrs. Rosalie M. Michelson, Environmental Protection Agency, Region VII. 1000 hours. 29 December 1972.

9. Gene E. Jordan, Written Communication to Jerome H. Svore, Regional Administrator, Environmental Protection Agency. Office of Director, Public Works, City of Omaha. 17 May 1972.

10. H. Turnbull, J. G. DeMann, and R.F. Weston. *"Toxicity of Various Refinery Materials to Fresh Water Fish."* Symposium on Waste Disposal in the Petroleum Industry, Industrial Engineering Chemistry 46:324, 1954.

11. Charles A. Geisler, Written Communication and Attachments to J. L. Higgins, Department of Environmental Control, State of Nebraska. City Sanitation Engineer, Public Works, City of Omaha. 14 September 1972.

12. *Water Quality Criteria*, Report of the National Technical Advisory Committee to D.C. 1 April 1968.

13. Donald I. Mount and Charles E. Stephan, "Chronic Toxicity to Fathead Minnow, (Pimephales *Promelas*)," Journal of the Fisheries Research Board of Canada. Vol. 26, No. 9. 1969.

A-1

APPENDIX A

EXCERPTS FROM
NEBRASKA WATER QUALITY STANDARDS

STATEMENT OF AUTHORITY, OBJECTIVE AND POLICY

The Federal Water Quality Act of 1965 (Public Law 89-234) provides that the States may, prior to June 30, 1967, and after public hearing, adopt Water Quality Criteria applicable to interstate waters or portions thereof within the State, together with a plan for implementation and enforcement of such criteria.

These standards were initially adopted by the Nebraska Water Pollution Control Council, a predecessor agency of the Department of Environmental Control. In the Environmental Protection Act of 1971 it was provided:

81-1505(5). All standards of quality of air, water or land adopted pursuant to law prior to the effective date of this act and applicable to specified air, waters or land are hereby approved and adopted as standards of quality of such air, waters, or land.

The Environmental Protection Act also provided:

81-1502(20). Water pollution shall mean contamination or other alteration of the physical, chemical, or biological properties of any waters of the state, including change in temperature, taste, color, turbidity, or odor of the waters or such discharge of any liquid, gaseous, solid, radioactive, or other substance into any waters of the state as will or is likely to create a nuisance or render such waters harmful, detrimental, or injurious to public health, safety or welfare, or to domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses, or to livestock, wild animals, birds, fish or other aquatic life, or degrade the water from its intended use...

81-1503(11). The department is hereby designated as the state air pollution and water pollution control agency for this state for all purposes of... the Federal Water Pollution Control Act, as amended (33 United States Code 466), and for the administration of all federal and state grants and incentives for environmental protection, and it is hereby authorized to take all action necessary or appropriate to secure to this state the benefits of those acts.

Section 81-1505(5) provides that all standards of quality of air adopted pursuant to law prior to the act were approved and adopted. This is interpreted to include the following policy:

To protect and enhance the quality of productivity of the waters, all municipal wastes shall receive at least secondary treatment plus such additional treatment as is required to maintain Water Quality Criteria. All industrial wastes shall receive an equivalent degree of treatment or control consistent with waste characteristics, uses and quality of receiving waters.

The objective of treatment or control will be to reduce the organic level, oil, grease, solids, alkali, acids, toxic materials, color and turbidity, taste and odor products and other deleterious materials to such a level as to meet the Water Quality Criteria contained in these Standards.

Waters whose existing quality is better than the established standards as of the date on which such standards become effective will be maintained at this high quality unless it has been affirmatively demonstrated to the State that a change is justifiable as a result of necessary economic or social development. Any industrial, public or private project or development which would constitute a new source of pollution or an increased source of pollution to high quality waters will be required to provide the necessary degree of waste treatment to maintain high water quality. In implementing this policy, the Secretary of the Interior will be kept advised and will be provided with such information as he will need to discharge his responsibilities under the Federal Water Pollution Control Act, as amended.

INTRODUCTION

The values presented on the enclosed Water Quality Criteria table are criteria for the receiving waters of the State. Waste from municipal, industrial, agricultural or any other type of man's activity shall not degrade the water quality of the receiving waters beyond the limits prescribed by the Water Quality Criteria Table. The criteria are designed to protect and enhance the receiving waters for the designated uses.

Many parameters may be used to measure water quality in streams. We have selected those which are believed to be the most significant and the most critical for the given use in each Class. Future research and technology will undoubtedly necessitate modification of the water quality criteria.

Existing water quality data are somewhat limited. However, the criteria on the enclosed table generally are in accordance with those found in Nebraska waters. Where the existing water quality is better than the proposed criteria, it is the intent of the Council to maintain the existing high quality commensurate with present and future water uses.

When a stream or reservoir (Table 1 - Interstate Stream Uses in Nebraska) has more than one water use classification, the most stringent parameters will apply. (Table II - Water Quality Criteria)

INTERSTATE STREAMS

"The Guidelines for Establishing Water Quality Standards for Interstate Waters" issued by the Department of Interior, May 1966, defines interstate waters as all rivers, lakes, and other waters that flow across or form a part of State boundaries including coastal waters. In Nebraska interstate streams are of three specific types:

(1) Those streams entering Nebraska from another State.
(2) Those streams leaving Nebraska to another State.
(3) Those streams acting as a boundary of the State.

Major streams entering Nebraska from another state are Ponca Creek, Horse Creek, Keya Paha River, Niobrara River, North Platte River, Lodgepole Creek, South Platte River, Frenchman River, North Fork Republican River, Arikaree River, South Fork Republican River, Beaver Creek, Sappa Creek, Prairie Dog Creek, and South Fork Nemaha River.

Major streams leaving Nebraska to another State are White Clay Creek, White River, Hat Creek, Republican River, Little Blue River, Big Blue River, and Platte River.

The Missouri River is the only river that acts as a boundary with other States which are South Dakota, Iowa, and Missouri.

In addition to the major streams listed, it is recognized that there are many minor tributaries to the above streams that cross the various State boundaries. These streams will not support detailed criteria without flow augmentation. As shown, only general criteria are proposed for these streams. Appendix I shows the location of all interstate streams in Nebraska.

Since water quality, in many instances, is affected by the volume of flow in a stream, it is essential to ascertain the flow characteristics of a stream. In the State of Nebraska, almost all flow data in streams have been gathered by the United State Geological Survey in cooperation with the Nebraska Department of Water Resources and other State and Federal Agencies through a network of stream-gaging stations. Pertinent data on stream flow at selected stations on interstate streams in Nebraska are shown in tabular form in Appendix II. These flow data were obtained from "Stream Flow Characteristics" for Sub-Basins 3, 5, 6, 7, and 9 of the Missouri River Basin prepared by the Work Group in Hydrologic Analysis and Projections, Standing Committee of Comprehensive Basin Planning, Missouri Basin Inter-Agency Committee in August 1966.

DEFINITION AND EXPLANATION OF WATER USES

Water Supply

This is raw water source which is intended for use as a potable water supply. It is suitable for treatment by coagulation, sedimentation, filtration, and chlorination to yield a finished water suitable for human consumption. After such treatment, this water may be used for domestic drinking water supply, food processing, liquid ingredient in beverages, and other similar uses.

Full Body Contact Sports

This is a surface raw water source which is intended for uses where the human body may come in direct contact with the raw water to the point of complete body submergence. The raw water may be ingested accidentally and certain sensitive body organs, such as the eyes, ears, nose, etc., may be exposed to the water. Although the water may be ingested accidentally, it is not intended to be used as a potable supply unless acceptable treatment is applied. This water may be used for swimming, water skiing, skin diving, and other similar activities.

Partial Body Contact Sports

This is a surface raw water source where the human body may come in direct contact with the water but normally not to the point of complete submergence. It is very unlikely that this water will be ingested nor will critical organs such as eyes, ears and nose normally be exposed to the water. This water may be used for fishing, hunting, trapping, boating, and other similar activities.

Fish, Wildlife, and Other Aquatic and Semiaquatic Life

This is a surface raw water source suitable for the growth and propagation of fish, waterfowl, furbearers, other aquatic life, semiaquatic life, and wildlife.

This water may be used for trout habitat, warm water fish habitat, wildlife habitat and other similar uses.

Agricultural

This is a raw water supply which is suitable for general agricultural usage. It may be used for irrigation, livestock watering and other similar uses.

Industrial

This is a raw water source which is intended for use in manufacturing processes other than food, beverage or similar processing. This water may be used for cooling water, a liquid ingredient in products other than food products, equipment-washing and similar activities. Two of the major uses of industrial water are hydroelectric power generation and cooling water for steam power generation.

GENERAL WATER QUALITY CRITERIA

All surface waters shall meet general aesthetic standards and shall be capable of supporting desirable diversified aquatic life. These waters shall be free of substances attributable to discharges or wastes having materials that will form objectionable deposits, floating debris, oil scum and other matter producing objectionable color, odor, taste or turbidity - materials including radionuclides, in concentration or combinations which are toxic or which produce undesirable physiological responses in human, fish or other animal life or plants and substances and conditions or combinations thereof in concentrations which produce undesirable aquatic life.

Facilities for expediting mixing and dispersing all waste water into receiving waters, shall be provided when deemed necessary by the Nebraska Environmental Control Council, to maintain the quality of the receiving waters in accordance with applicable water quality criteria.

GENERAL DEFINITION OF TERMS

1. Biochemical Oxygen Demand (BOD) - The BOD is the measure of the amount of oxygen necessary to satisfy the biochemical oxidation requirements of pollution at the time the sample is collected. Unless otherwise specified, this term will mean the 5-day BOD incubated at 20°C.

2. Coliform Group Organisms (Total Coliform Organisms) - The coliform group includes all of the aerobic and facultative anaerobic, Gram-negative, non-spore-forming, rod-shaped bacteria that ferment lactose broth with gas formation within 48 hours at 35°C.

3. Colloidal Substances - Minute clay or other substances which do not settle out without the use of a floculant.

4. Disinfection - A method of reducing the pathogenic or objectionable microorganisms by means of chemicals or other acceptable means.

5. Dissolved Oxygen (DO) - This is a measure of the amount of free oxygen in the water.

6. Fecal Coliform - The portion of the coliform group which is present in the gut or the feces of warm-blooded animals generally includes organisms which are capable of producing gas from lactose broth in a suitable culture medium within 24 hours at 44.5° ± 0.5°C.

7. Feedlot - Shall mean the confined feeding of food, fur or pleasure animals in buildings, lots, pens, pools or ponds which normally are not used for raising crops or for grazing animals.

8. Membrane Filter (MF) - A technique of bacteriological analysis. This technique involves the running of a certain volume of water through a cellulose ester wafer which is then impregnated with growth media for bacteria.

9. Milligrams per Liter (mg/l) - Milligrams of solute per liter of solution. Equivalent to parts per million assuming unit density.

10. "Most Probable Number" (MPN) - A test of bacterial density expressed as a number of organisms per hundred milliliters. It is a number most likely to occur, using statistical methods, under the given circumstances or conditions of the test.

11. pH - The pH value indicates the relative intensity of acidity or alkalinity of water with the neutral point at 7.0.

12. Primary Treatment - The removal of settleable and floatable materials from a waste water.

13. Secondary Treatment - A method of waste treatment beyond primary treatment where pollutants in solution or the colloidal state are biologically or chemically removed. The minimum treatment required under this method is removal of at least 85 percent of the BOD and suspended solids.

14. Settleable Solids - Substances such as erosional silt, organic detritus, plankton, and sand, which, because of particle size or lack of water currents, settle to the bottom of a stream course (or a laboratory sample bottle).

15. Sodium Absorption Ratio - (SAR) This is an expression of the relative activity of sodium ions in exchange reaction with soil and is an index of sodium or alkali hazard to the soil. This ratio should be known especially for water used for irrigation. The SAR is calculated by the use of the following empirical equation:

$$SAR = Na^{+} / \sqrt{Ca^{++} + Mg^{++} / 2}$$

where Na^{+}, Ca^{++}, and Mg^{++} represent the concentrations in milliequivalents per liter of the respective ions.

16. Specific Conductivity - (Conductance) - A measure of ion concentration of water, expressed as micromhos per centimeter at 25°C.

17. Suspended Solids - Substances such as erosional silt, organic detritus, plankton, and sand, which are held in suspension by water currents.

18. Total Dissolved Solids - Solids which are present in solution.

Note:

The method of water sample collection, sample preservation, analysis, and measurement to determine water quality and the accuracy of results shall be in accordance with the latest Edition of *Standard Methods for the Examination of Water and Wastewater*, or by appropriate regulations or procedures approved by the Nebraska Environmental Control Council.

TABLE I

INTERSTATE STREAM USES IN NEBRASKA

Stream	Reach of Stream		Classification of Water Uses*
	From	To	
1. North Fork Republican River	Colo.-Nebr. Line	Confluence Republican River	C
2. South Fork Republican River	Kans.-Nebr. Line	Confluence Republican River	C
3. Arikaree River	Kans.-Nebr. Line	Confluence Republican River	C
4. Republican River	Confluence North Fork Republican River	Swanson Reservoir	C
	Swanson Reservoir		B, C
	Swanson Reservoir	Harlan County Reservoir	C
	Harlan County Reservoir		B, C
	Harlan County Reservoir	Nebr.-Kans. Line	C
5. Frenchman River	Colo.-Nebr. Line	Enders Reservoir	C
	Enders Reservoir		B, C
	Enders Reservoir	Confluence Republican River	C
6. Beaver Creek	Kans.-Nebr. Line	Confluence Sappa Creek	C
	Confluence Sappa Creek	Confluence Republican R.	C
7. Sappa Creek	Kans.-Nebr. Line	Confluence Beaver Creek	C
8. Prairie Dog Creek	Kans.-Nebr. Line	Confluence Republican River	C

TABLE I (Continued)

INTERSTATE STREAM USES IN NEBRASKA

Stream	Reach of Stream		Classification of Water Uses*
	From	To	
9. Little Blue River	Headwaters	Confluence Cottonwood Creek	A, C
	Confluence Cottonwood Creek	Kans.-Nebr. Line	C
10. Big Blue River	Headwaters	Kans.-Nebr. Line	A, C
11. Horse Creek	Wyo.-Nebr. Line	Confluence North Platte River	C
12. North Platte River	Wyo.-Nebr. Line	Lake McConaughy	C
	Lake McConaughy		B, C
	Lake McConaughy	Confluence Platte River	C
13. South Platte River	Colo.-Nebr. Line	Confluence Platte River	C
14. Platte River	Confluence S. Platte River	Confluence Missouri River	C
15. Lodgepole Creek	Wyo.-Nebr. Line	Kimball Reservoir	C
	Kimball Reservoir		B, C
	Kimball Reservoir	Nebr.-Colo. Line	C
16. Niobrara River	Wyo.-Nebr. Line	Box Butte Reservoir	A, C
	Box Butte Reservoir		B, C
	Box Butte Reservoir	Confluence Missouri River	A, C

TABLE I (Continued)

INTERSTATE STREAM USES IN NEBRASKA

Stream	Reach of Stream		Classification of Water Uses*
	From	To	
17. Keya Paha River	S. Dak.-Nebr. Line	Confluence Niobrara River	A, C
18. White River	Headwaters	Crawford Water Intake	A, C
	Crawford Water Intake	S. Dak.-Nebr. Line	C
19. Hat Creek	Headwaters	S. Dak.-Nebr. Line	A, C
20. White Clay Creek	Headwaters	S. Dak.-Nebr. Line	A, C
21. Ponca Creek	S. Dak.-Nebr. Line	Confluence Missouri River	C
22. South Fork Nemaha River	Kans.-Nebr. Line	Confluence Missouri River	C
23. Missouri River	S. Dak.-Nebr. Line	Kans.-Nebr. Line	A, C

* A = Domestic Water Supply

B = Full Body Contact Sports

C = Agricultural, Industrial and other Beneficial Uses

For a detailed description of these uses, see page 9 of this document.

WATER USE CLASSIFICATION

Water Quality Criteria were adopted in accordance with existing quality and present and future uses. These are intended to maintain or enhance the present water quality.

Water use classifications were determined by the Nebraska Environmental Control Council and substantiated by public hearings. These classifications are:

CLASS	USE	DESCRIPTION
'A'	Domestic Water Supply	Those waters of the State that are currently used for water supply and portions of other waters of the State which currently have a very high quality water. These waters can be utilized for water supply with treatment as outlined above, and those uses listed in the Class 'C' category below.
'B'	Full Body Contact Sports	This shall include all water or parts thereof within or adjacent to publicly operated recreation areas and all existing reservoirs, ponds, and other impoundments, excepting those designated by the Nebraska Environmental Control Council as wastewater lagoons. For purpose of delineating boundaries, the upstream limit(s) of an impoundment is considered to be the point in a stream bed(s) having the same elevation as a principal spillway. Full body contact criteria will protect the waters for all beneficial uses except water supply.
'C'	Agricultural, Industrial & Other Beneficial Uses	All waters not designated as water supply or full body contact sports are protected by these criteria. The quality of this water is intended to be such as to be suitable for partial body contact sports, growth and propagation of fish, waterfowl, furbearers, wildlife, and other aquatic and semi-aquatic life. It is also suitable for agricultural use including irrigation and livestock watering, and industrial use. The aesthetic value of these waters will also be protected.

STATE OF NEBRASKA ENVIRONMENTAL CONTROL COUNCIL

WASTE WATER SHALL NOT DEGRADE THE RECEIVING WATERS BELOW THE FOLLOWING CRITERIA. THESE CRITERIA

PARAMETER / WATER USE	COLIFORMS 1 GROUP ORGANISMS	TASTE & ODOR 2 PRODUCING SUBSTANCES	SUSPENDED 3 COLLOIDAL, OR SETTLEABLE SOLIDS	TOXIC AND 4 DELETERIOUS SUBSTANCES
CLASS "A" DOMESTIC WATER SUPPLY	Coliform group and fecal coliform organisms shall not exceed a geometric mean 10,000 total or 2,000 fecal coliform organisms per 100 milliliters. No more than 10% of samples shall exceed 20,000 total or 4,000 fecal coliform bacteria.	Concentration of substances shall be less than that amount which would degrade the water quality for the designated use. Phenols concentration shall not exceed 0.001 mg/l.	None from waste water sources which will permit objectionable deposition or be deleterious for the designated uses. In no case shall turbidity caused by waste water impart more than a 10% increase in turbidity to the receiving stream.	None alone or in combination with other substances or wastes in concentration of such nature so as to render the receiving water unsafe or unsuitable for the designated use. Raw water shall be of such quality that after treatment by coagulation, filtration, sedimentation, the water will meet Public Health Drinking Water Standards. Radiological limits shall be in accordance with the Radiological Health Regulations, State of Nebraska, 1st edition 1966, and as amended in its latest edition.
CLASS "B" FULL BODY CONTACT SPORTS	Shall not exceed a geometric mean of 200 fecal coliform organisms per 100 milliliters and shall not exceed 400 per 100 milliliters in more than 10% of the samples.	None in amounts which would be sufficient to interfere with designated use.	Same as WATER SUPPLY -3-	Same as WATER SUPPLY -4-
CLASS "C" Agricultural uses including irrigation & livestock watering Partial Body Contact Sports Growth & Propagation of fish, waterfowl, fur bearers, & other aquatic and semi-aquatic life, and wildlife. Industrial	Same as WATER SUPPLY -1-	Same as WATER SUPPLY -2- Shall not contain concentrations of substances which will render any undesirable taste to fish, flesh, or in any other way make such fish flesh inedible.	Same as WATER SUPPLY -3-	Same as WATER SUPPLY -4- Plus ammonia nitrogen concentrations shall not exceed 1.4 mg/l in trout streams nor exceed 3.5 mg/l in warm water streams where the pH in these streams does not exceed a pH value of 8.3. If the pH of a stream exceeds 8.3, the undissociated ammonium hydroxide as nitrogen shall not exceed one-tenth mg/l in trout streams nor exceed 0.25 mg/l in warm water streams.[2] For irrigation use, the boron concentration shall not exceed 0.75 mg/l. For toxic materials not specified biossay methods acceptable to Nebraska Water Pollution Control Council will be used.
INTERMITTENT Water Quality Criteria for Intermittent Streams[1]	Coliform group and fecal coliform organisms shall not exceed a geometric mean of 20,000 total coliform organisms or 4,000 fecal coliform organisms per 100 milliliters.	Same as Agricultural, Industrial and other Beneficial Uses.	Suspended Solids shall not exceed 30 mg/l.	Same as Agricultural, Industrial and other Beneficial Uses -4-

The method of water sample collection, sample preservation, analysis, and measurement to determine water quality and the accuracy of the results shall be in accordance with the latest Edition of Standard Methods for the Examination of Water and Wastewater, or by appropriate regulations or procedures approved by the Nebraska Environmental Control Council. Every effort shall be made to make the samples representative of the receiving waters after reasonable opportunity for mixing with the wastewater.

[1] See definition of intermittent stream on Page 17. [2] See Appendix VII.

ARE APPLICABLE AT FLOWS EQUAL TO OR GREATER THAN THE LOWEST FLOW FOR SEVEN (7) CONSECUTIVE DAYS WHICH CAN BE EXPECTED TO OCCUR AT A FREQUENCY OF ONCE EVERY TEN YEARS.

For Temperatures: Flows considered are for ice-free conditions.

5 TEMPERATURE	6 DISSOLVED OXYGEN	7 HYDROGEN ION	8 TOTAL DISSOLVED SOLIDS	9 RESIDUE OIL & FLOATING SUBSTANCES	10 AESTHETIC CONSIDER-ATIONS
The temperature of the receiving water shall not be increased by a total of more than 5°F from May through October and not more than a total of 10°F from November through April. Maximum rate of change limited to 2°F per hour.	Shall not be lower than 5 mg/l in warm waters and 6 mg/l in trout waters.	Hydrogen ion concentrations expressed as pH shall be maintained between 6.5 & 9.0 with a maximum total change of 1.0 pH unit from the value in the receiving stream.	A point source discharge shall not increase the total dissolved solids (TDS) concentration of a receiving water by more than 10% and in no case shall the total dissolved solids of a stream exceed 600 mg/l. Data regarding specific conductivity will be considered in lieu of TDS data. A point source discharge shall not increase the conductivity of the receiving water by more than 10% and in no case shall the conductivity exceed 900 micromhos per centimeter at 25°C.	No residue attributable to waste water or visible films of oil or globules of grease shall be present Emulsified oil and grease shall be less than 15 mg/l.	No evidence of matter that creates nuisance conditions or is offensive to the senses of sight, touch, smell, or taste, including color.
Same as WATER SUPPLY -5-	Same as WATER SUPPLY -6-	Same as WATER SUPPLY -7-	Same as Agricultural, ETC. -8-	Same as WATER SUPPLY -9-	Same as WATER SUPPLY -10-
Trout Waters[3] Allowable Change 5° F Maximum Limit 65°F Warm Water Waters Allowable Change 5° F May thru Oct; 10°F Nov thru April Maximum Limit 90°F Maximum Rate of Change limited to 2° per hour. * * * For Missouri River, from South Dakota-Nebraska State line near Ft. Randall Dam to Sioux City, Iowa. Maximum temp 85°F Allowable Change 4°F	Same as WATER SUPPLY -6-	Same as WATER SUPPLY -7-	A point source discharge shall not increase the total dissolved solids concentration of a receiving water by more that 20%, this value shall not exceed 100 mg/l, and in no case shall the total dissolved solids of a stream exceed 1500 mg/l. Data regarding specific conductivity will be considered in lieu of TDS data. A point source discharge shall not increase the conductivity of the recovery water by more than 20%, this value shall not exceed 150 micromhos/centimeter, and in no case shall the conductivity of the receiving waters exceed 2250 micromhos/centimeter at 25°C. For irrigation use the SAR value and conductivity shall not be greater than a C3-S2 class irrigation water as shown in Fig. 25 of Agricultural Handbook 60.[4]	Same as WATER SUPPLY -9-	Same as WATER SUPPLY -10-
	Wastewater discharges shall not exceed 30 mg/l in B.O.D.[4]	Same as WATER SUPPLY -7-		Same as WATER SUPPLY -9-	Same as WATER SUPPLY -10-

---

[3] See Appendix VIII [4] See Appendix IX

PLAN OF IMPLEMENTATION AND ENFORCEMENT

General

It is recognized that a comprehensive program of monitoring, surveillance and control is necessary to meet the requirements of the Federal Water Quality Act of 1965.

Water quality criteria only state the quality to be established to protect beneficial water uses. A plan of implementation and enforcement will protect existing high quality waters and improve waters that are degraded by pollutants.

A. Water Uses

All surface waters have been evaluated and placed in groups on beneficial uses of the waters for present and future uses. These uses and water quality to protect these uses are a part of the standards.

It is anticipated that the present uses of the waters will also be the future uses since Nebraska has an abundance of ground water which is more economical to develop at the present time than surface water for municipal and industrial purposes. It is realized that consideration must be given to changing water quality criteria on a stream to protect water uses that are not predictable at the present time.

It is the consensus of the Nebraska Environmental Control Council that the water quality criteria are essentially being met. As more detailed monitoring and surveillance is initiated, more areas of degradation will undoubtedly be uncovered.

A map entitled Appendix I shows the interstate waters.

B. Sources of Pollution and Treatment Needs

A list of the known sources of municipal and industrial wastes has been compiled. These lists are contained in Supplement A to the Water Quality Standards.

It is recognized that there are numerous industrial sources of pollution for which no reliable data relating to strength and volume are available at the present time. The preparation of an industrial waste inventory, including agricultural and related wastes, will be completed by December 31, 1968, and together with a plan of implementation and enforcement will be submitted within one month thereafter to the Secretary of the Interior.

C. Other Programs to Control and Abate Pollution

1. Combined Sewer Overflows

Combined sewer overflows are recognized as a source of objectionable pollutants in many of the older sewer systems. It is hoped that through some of the Federal aid programs that the problem of combined sewer overflows will be researched and a solution provided by December 31, 1977. In the meantime, it is the policy of the Nebraska Environmental Control Council to encourage the separation of storm and sanitary sewers and to disapprove any extension of combined systems.

2. Agricultural Wastes

Feedlots: The State of Nebraska supports a large and important livestock industry. The northwestern section of the State is noted for the production of feeder cattle. However, the concentration of cattle in lots undergoing intensified feeding for the slaughter market is distributed throughout the State with heaviest concentration of lots in the eastern one-third of the State.

Information supplied to the Nebraska Environmental Control Council from recent Federal agricultural statistics indicates that the number and size of cattle feedlots is as follows:

Size (No. of Head)	Number in Nebraska
Under 1,000	20,719
1,000-2,000	285
2,000-4,000	120
4,000-8,000	60
8,000-Plus	24

The Nebraska Environmental Control Council will work with livestock feeders to develop sound feedlot waste disposal practices. Feedlot wastes shall be effectively controlled by no later than December 31, 1972, with earlier compliance where necessary.

Irrigation: The State has 3,200,000 acres of land under irrigation; of these 1.1 million acres use surface water supplies, 2.1 million acres use wells as sources of irrigation water. The irrigated land is primarily in the central and western portions of the State. The use of water for irrigation is a comsumptive use and this affects water quality through increases in total dissolved solids, silt, nutrients, temperature, and in some cases pesticides.

The Nebraska Environmental Control Council will work with irrigation interests to develop good irrigation practices. A joint survey will be made with the Nebraska Department of Water Resources to inventory irrigation return flows in the State and identify those which are causing degradation of water quality. This survey is scheduled to be completed by December 31, 1972.

3. Wastes from Vessels and Marinas

Boat pollution is covered by rules and regulations of the Nebraska Game and Parks Commission; "every vessel equipped with kitchen or toilet facilities shall handle and treat solid and liquid wastes in a manner that will prevent water pollution. No wastes or container of such wastes shall be placed, left or discharged in or near any waters of the State".

An effective and uniform set of regulations will be operational by December 31, 1972.

4. Land Erosion

The Soil Conservation Service reports that approximately 18,000,000 acres of land have received proper land treatment to prevent erosion. The total land area of the State which could possibly benefit from good soil conservation practices is 47,443,000 acres. In addition, 1,935,000 acres have been seeded to grass; 900,0[illegible] es have been leveled; 37,598 farm ponds have been constructed and 146,000 miles of terraces have been constructed. It is with pride that the State of Nebraska reports that in 1966, the State ranked 2nd in the amount of land that had been leveled, 2nd in the amount of terracing which had been accomplished, 9th in the number of acres of strip cropping, 7th in the number of acres returned to grass and 11th in the number of farm ponds completed as a part of its soil conservation activity.

It is the policy of the Nebraska Soil and Water Conservation Commission that this cooperative federal-state program will be continued or even accelerated to control runoff and silt to the streams of the State.

The Nebraska Environmental Control Council will cooperate with the Nebraska Soil and Water Conservation Commission in developing a program to combat this form of pollution.

5. Sand and Gravel Extraction

The Council is presently working with the Nebraska Sand and Gravel Association and is in the process of developing guidelines to adequately control waste discharges from sand and gravel pumping operations. Waste discharges from these operations shall be effectively controlled by January 1, 1972.

6. Operation and Maintenance of Wastewater Treatment Facilities

Wastewater treatment plants shall be operated continuously at their maximum capability to attain the highest possible levels of water quality, including dissolved oxygen, to preserve, maintain, and enhance the waters of the State for the specified uses.

A visit will be made to each treatment plant by Department of Environmental Control personnel on at least an annual basis to determine the degree of treatment provided, the status of needed improvements, and to provide technical assistance to the operator. More frequent visits will be made to larger plants or to those having problems. A formal report will be prepared, and submitted to the controlling authority and the operator. Enforcement procedure will be initiated in cases where a plant is by-passed without authority or inadequately operated.

Operator training is presently provided through a correspondence course and training programs administered by the Nebraska Water Pollution Control Association and the Nebraska Department of Environmental Control. This program includes a voluntary certification program. Certification of operators and operator training is encouraged at all times.

A program will be developed which will require operators of significant municipal and industrial waste treatment plants to submit routine operating reports including specific waste quality data to the State.

D. Date of Compliance

All municipal wastes shall receive at least secondary treatment plus such additional treatment as is required to maintain Water Quality Criteria, as set forth in these Standards. All other wastes shall receive an equivalent degree of treatment or control consistent with waste characteristics, uses and quality of receiving waters.

The date for compliance with the requirements of these Standards for all municipal, industrial, and other wastes which discharge into intrastate and interstate waters of the State, except for those waste sources discharging directly into the Missouri River, shall be January 1, 1972, with earlier compliance where necessary. The date for compliance with these Standards for all municipal, industrial, and other wastes discharging directly into the Missouri River shall be December 31, 1975, with earlier compliance where necessary. All proposed construction of waste treatment facilities in the interim periods prior to the dates of compliance shall provide treatment consistent with the policies and objectives of these Standards.

A supplemental document indicating waste sources and waste treatment facilities on Nebraska waters is available to all interested persons.

E. State Statutory Authority

Enforcement of water quality criteria and other requirements of these Standards will initially be by informal conference with the person or persons responsible for the violation. This procedure will be followed up by formal hearing and court action where necessary to secure compliance, all in accordance with the Environmental Protection Act, as amended.

F. Stream Surveillance Program

Proposed monitoring, sampling, and surveillance of streams and other bodies of waters is intended to supplement existing sampling stations currently in operation in Nebraska by various State and Federal agencies. A current program is under way involving various State and Federal agencies whereby water data collection will be coordinated by all agencies.

The Nebraska Department of Environmental Control has established a total of 28 regular sampling stations on various streams throughout the State. These regular stations are being sampled monthly. The minimum monthly schedule may be amended to determine seasonal changes due to irrigation return flows, industrial activity, and temperature effects.

In addition to the regular sampling stations, approximately 225 additional sampling sites have been established on Nebraska waters to ascertain basic water quality. These sites are generally sampled on a quarterly basis.

The United States Geological Survey also obtain records of fish kills and other reported cases of acute water pollution. These may involve physical, chemical, and biological evaluation of the streams. When full compliance with the Water Quality Standards is achieved, the latter activity hopefully will be diminished.

It is anticipated that surveys will be made on all streams to evaluate their water quality. Routine monitoring of existing and future waste water discharges will be implemented in some cases. A basic record of the location, source, and type of pollutant will be compiled and kept current.

G. Method of Water Sample Collection

The method of water sample collection, sample preservation, analysis, and measurement to determine waste quality and the accuracy of the results shall be in accordance with the latest Edition of Standard Methods for the Examination of Water and Wastewater, or by appropriate regulations or procedures approved by the Nebraska Environmental Control Council or the U. S. Environmental Protection Agency.

H. Stream Flow Design Criteria

The Water Quality Criteria contained in these standards are applicable at flows equal to or greater than the lowest flow for seven consecutive days which can be expected to occur at a frequency of once every ten years except as shown before. For design purposes, this flow may be determined by any accepted statistical procedure using published stream flow data such as Gumbel's method of logarithmic extremal probability using low mean discharge data from the Missouri Basin Inter-Agency Committee studies. The drought flow at any point along a stream may be determined by relating the drought flows at gaging stations and their drainage areas to the drainage above the point of interest on the stream.

"Water Quality Criteria for Intermittent Waters shall apply:" (1) Whenever the waste source is discharging into waters with a record of periodic zero flows, (7-consecutive day one in 10-year low flow), (2) Whenever the design flow of the waste source is greater than the design drought flow, (7-consecutive day one in 10-year low flow), (3) Whenever the actual flow of the receiving waters is less than the waste source discharge.

I. Criteria for Intermittent Waters

All municipal of domestic wastes discharged into intermittent waters shall have been subjected to at least secondary treatment or its equivalent and, when prescribed such additional treatment as necessary to maintain Water Quality Criteria. Industrial, agricultural, or other waste waters not amenable to biological treatment discharged into intermittent waters shall be physically or chemically treated such as to maintain Water Quality Criteria.

J. Storage and Handling of Toxic and Other Objectionable Materials

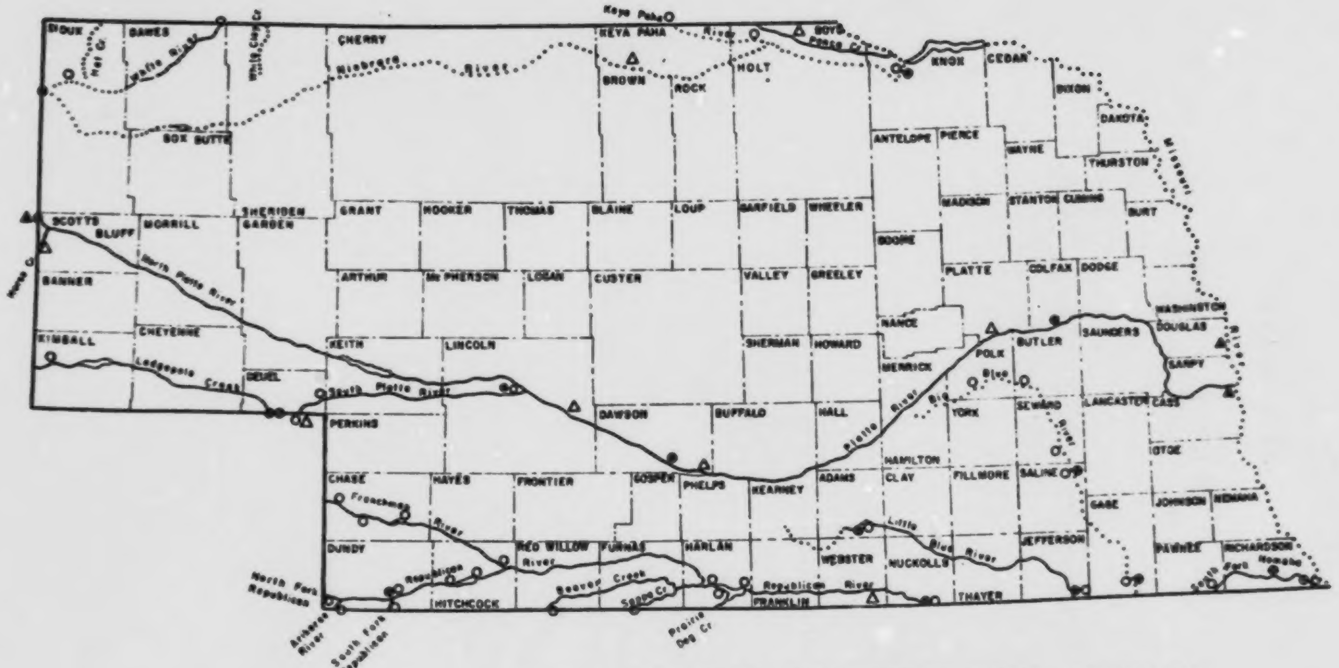
No substance shall be stored, kept, or allowed to remain in or upon any site without reasonable safeguards adequate to prevent the escape or movement of the substance or a solution thereof from the site under any conditions or failure of the storage facilities whereby pollution of any waters of the State might result therefrom. Safeguards such as diking, holding ponds or other controls around such structures shall comply to the requirements of the Nebraska Environmental Control Council for interstate waters.

It shall be the duty of the owner or other responsible person of a storage facility to notify the Chairman of the Nebraska Environmental Control Council of any loss of stored material either by accident or otherwise when such loss involves a substance which would be likely to enter any waters of the State. Said notice shall be by telephone or other comparable means and shall be made immediately upon discovery of the loss.

X. Date of Compliance

All persons must comply with these Standards by no later than March 1, 1971, with the exception of those sections specifically dealing with the requirement of mandatory secondary treatment.

APPENDIX I


SIOUX
DAWES
Hat Cr
White River
White Clay Cr
CHERRY
Niobrara River
Keya Paha
KEYA PAHA
River
BOYD
Ponca Cr
BROWN
ROCK
HOLT
KNOX
CEDAR
DIXON
DAKOTA
Missouri
ANTELOPE
PIERCE
WAYNE
THURSTON
BOX BUTTE
SHERIDEN
GARDEN
GRANT
HOOKER
THOMAS
BLAINE
LOUP
GARFIELD
WHEELER
MADISON
STANTON
CUMING
BURT
SCOTTS BLUFF
MORRILL
Horse Cr
BANNER
North Platte River
ARTHUR
Mc PHERSON
LOGAN
CUSTER
VALLEY
GREELEY
BOONE
PLATTE
COLFAX
DODGE
WASHINGTON
DOUGLAS
KIMBALL
CHEYENNE
Lodgepole Creek
DEUEL
KEITH
LINCOLN
South Platte River
SHERMAN
HOWARD
NANCE
MERRICK
POLK
BUTLER
SAUNDERS
SARPY
River
PERKINS
DAWSON
BUFFALO
HALL
Platte River
Big Blue
YORK
SEWARD
LANCASTER
CASS
River
OTOE
HAMILTON
CHASE
HAYES
FRONTIER
GOSPER
PHELPS
KEARNEY
ADAMS
CLAY
FILLMORE
SALINE
GAGE
JOHNSON
NEMAHA
Frenchman
River
DUNDY
RED WILLOW
FURNAS
HARLAN
Little Blue River
WEBSTER
NUCKOLLS
JEFFERSON
PAWNEE
RICHARDSON
South Fork
Nemaha
North Fork Republican
Republican
River
Beaver Creek
Sappa Cr
Republican River
HITCHCOCK
FRANKLIN
THAYER
Arikaree River
South Fork Republican
Prairie Dog Cr

STATE OF NEBRASKA INTERSTATE STREAMS

LEGEND:

WATER USE CLASSIFICATIONS

.... A,C
— — — B,C
——— C

△ U.S.G.S. Stations
▲ Nat'l Water Quality Network Stations
● Monthly Department Stations
○ Quarterly Department Stations

APPENDIX VII

MAXIMUM PERMISSIBLE LIMIT OF AMMONIA EXPRESSED AS N AT VARIOUS pH VALUES

pH	Maximum Limit of Ammonia Expressed as parts per million N	
	Trout Waters	Warm Waters
8.3	1.4	3.5
8.4	1.2	2.9
8.5	1.0	2.4
8.6	0.84	2.1
8.7	0.72	1.8
8.8	0.60	1.4
8.9	0.56	1.2
9.0	0.48	1.1

APPENDIX VIII

STREAM CLASSIFICATIONS IN THE STUDY AREA

The following waters are designated as Class A, B, or C.

COUNTY	CLASS "A" WATERS
Cass	Missouri River
Douglas	Missouri River
Sarpy	Missouri River
	CLASS "B" WATERS
Douglas	Two Rivers Lakes King Lake Carter Lake Boystown Lake Hitchcock Park Lake, Omaha Benson " " " Hanscom " " " Miller " " " Fontennelle" " "
Sarpy	Offutt Air Force Lake

CLASS "C" WATERS

All Category 1 waters which are not designated A or B above, shall be Class C.

B-1

APPENDIX B

MUNICIPAL WASTEWATER TREATMENT PLANT REPORTS

MISSOURI RIVER WASTEWATER TREATMENT PLANT
OMAHA, NEBRASKA

A. GENERAL

The Missouri River Wastewater Treatment Plant is a primary treatment facility, with dry- and wet-weather design flows of 72 and 200 mgd, respectively. The present dry-weather flow is estimated at 38 mgd of which more than 50 percent is reported to be industrial.[1/] The plant was built in 1964 and designed for daily wasteloads of 270,000 lb of BOD, 244,000 lb of suspended solids, and 68,000 lb of grease. However, the south inlet complex of this plant [Figure 1] was not placed into service until 1970.*

During the survey EPA personnel evaluated water pollution control practices at the Central Wastewater Pretreatment Facility and The Quaker Oats Company. The effluent from each is discharged into the Missouri River plant for additional treatment. A combination of high solids-and-grease loadings and pH fluctuations results in operational problems (i.e., failure of grit-removal equipment, solids-and-grease carry-over in clarifier effluent, etc) within the Missouri River Wastewater Treatment Sewerage System. [Individual reports on each of these waste sources are contained in Appendix C.]

The Missouri River plant is manned continuously and is staffed with one superintendent, two foremen, one chemist, three engineers,

---

* The packing-house wastes did not receive pretreatment until 1970. The paunch, manure, and grease load in the south inlet exceeded the design capacity of the plant. The wastes were by-passed to the Missouri River.

31 operators (26 class-1 and 5 class-2 operators*), and 17 mechanics. Water pollution control practices were evaluated 31 July through 5 August 1972 by EPA personnel from the National Field Investigations Center-Denver. Charles Geisler, city sanitary engineer, provided assistance and information.

The sewerage system is comprised almost entirely of combined sewers (i.e., storm water and sanitary sewer). The combined flow is pumped by lift stations, located along the Missouri River, into an interceptor, except for two stations that pump directly into the Missouri River plant. Numerous problems have occurred with these lift stations, resulting in by-passing of raw sewage into the Missouri River.

The Enforcement Conference held in 1957[2/] concluded that the major source of pollution in the Missouri River from north of Omaha, Nebraska, to St. Joseph, Missouri, was the Omaha area and that the effects of this pollution were "(1) deterioration of water quality for the public water supply of St. Joseph, Missouri, with associated enhancement of possible disease transmission; (2) increased concentrations of coliform and other organisms associated with human diseases which constitute a health hazard to commercial and recreational users of the river; (3) deterioration of water quality so as to interfere with its use for stock watering; (4) deterioration of water quality so as to prevent full use of the commercial fishery of the Missouri River below Blair, Nebraska; (5) deterioration of water quality so as to create conditions

---

* The City of Omaha has a voluntary certification program for wastewater treatment plant operators -- Class 2 being the highest level.

B-2a

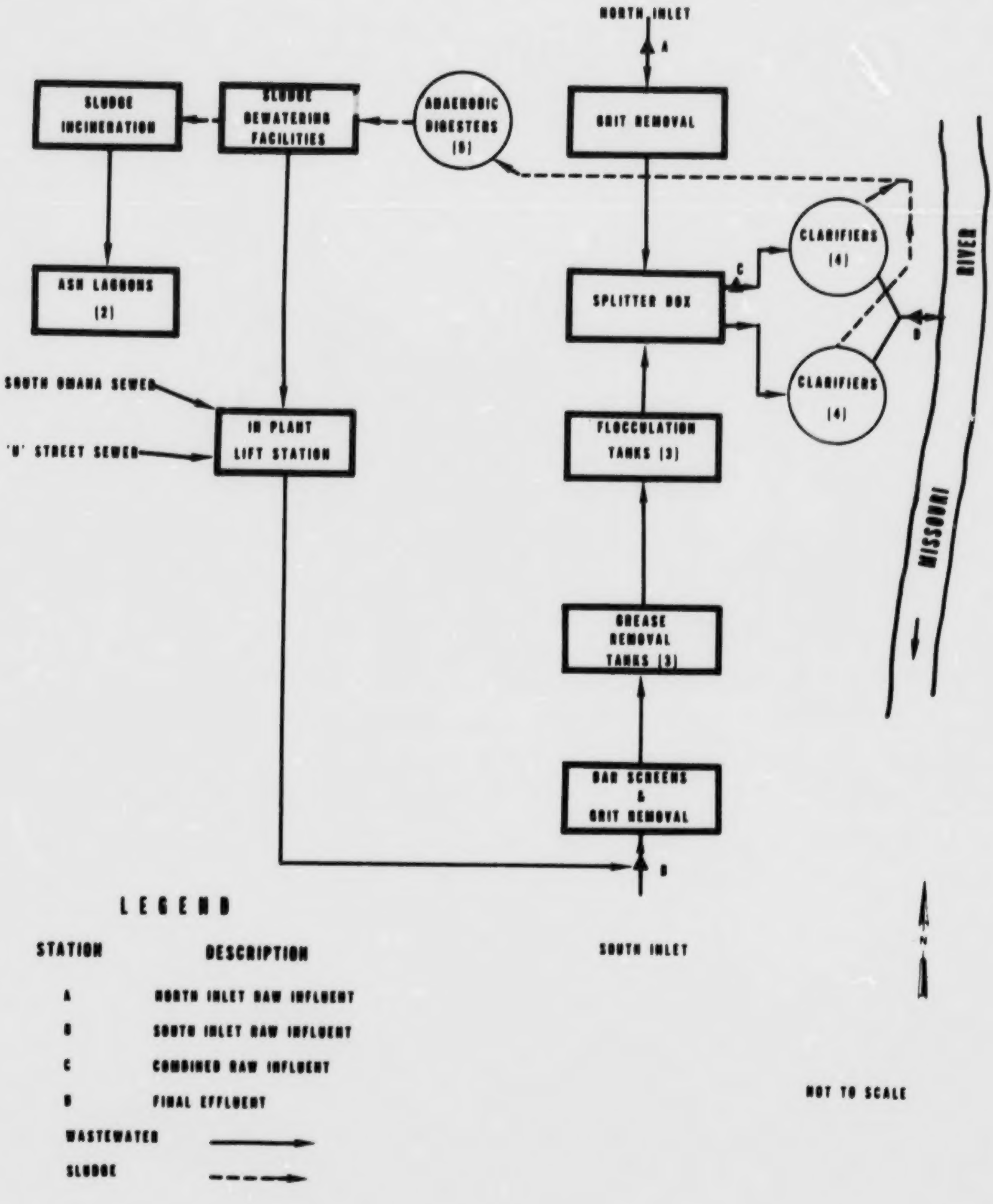

NORTH INLET
A
SLUDGE INCINERATION
SLUDGE DEWATERING FACILITIES
ANAEROBIC DIGESTERS (5)
GRIT REMOVAL
ASH LAGOONS (2)
CLARIFIERS (4)
C
SPLITTER BOX
D
CLARIFIERS (4)
RIVER
MISSOURI
SOUTH OMAHA SEWER
IN PLANT LIFT STATION
'U' STREET SEWER
FLOCCULATION TANKS (3)
GREASE REMOVAL TANKS (3)
BAR SCREENS & GRIT REMOVAL
B
SOUTH INLET
N
LEGEND
STATION
DESCRIPTION
A NORTH INLET RAW INFLUENT
B SOUTH INLET RAW INFLUENT
C COMBINED RAW INFLUENT
D FINAL EFFLUENT
WASTEWATER
SLUDGE
NOT TO SCALE

Figure 1. Schematic of Missouri River Wastewater Treatment Plant, Omaha, Nebraska

inimical to fish and wildlife in the area; and (6) impairment of water quality for many industrial uses."

It was recommended that adequate wastewater treatment be provided by the municipalities along the Missouri River as soon as possible and that the construction contract for the last treatment plant in Omaha be awarded by 1 January 1960.

During the second session of the Conference, July 1964,[3] the conferees required that after 15 December 1966 "no wastes are to be discharged to the Missouri River from Omaha without at least primary treatment."

The Nebraska State Department of Environmental Control has required that all wastewaters discharged into the Missouri River shall receive at least secondary treatment and disinfection by 31 December 1975.[4] The City is presently in the planning stages [Table 1] of secondary treatment for the Missouri River plant, and a preliminary Study and Report has been completed by Kirkham, Michael and Associates.[5]

B. WASTEWATER TREATMENT FACILITIES

Because of the differences in characteristics of wastewater from the north and south areas of Omaha, each flow receives separate preliminary treatment [Figure 1]. The flow entering the south inlet contains (1) the effluent from the Central Wastewater Pretreatment Facility which is pumped by the Monroe Street Lift Station, after screening and grit removal, (2) sewage from the South Omaha and "U" Street sewers, and (3) in-plant wastes (e.g., supernatant). These wastes receive preliminary treatment as follows:

TABLE 1

CITY OF OMAHA
SCHEDULE OF PROJECTS PROVIDING SECONDARY TREATMENT OF MUNICIPAL AND INDUSTRIAL WASTES

Project Description	Engineering Report	Financing Arrangements[a]	Final Plans & Specifications	Award of Construction Contract	Completion of Project
Missouri River post-primary treatment plant.	3/10/72	6/73	4/73	7/73	10/75
Grit removal structures, Leavenworth, Burt-Izard, and North Interceptor Stations.	6/72	6/73	10/73	1/74	12/75

---

[a] All financing arrangements are contingent upon Federal payment of 55 percent of eligible cost and State payment of 25 percent of eligible cost. Financing of local share of Missouri River Wastewater Treatment Plant and grit-removal structures will require, in June 1973, upward revision in the City of Omaha sewer service charge for some classes of users. (Note: Federal payment of 75% of eligible costs is now authorized.)

1. Bar screens - mechanically cleaned with 3/4-in. spacings between bars.
2. Aeration tanks (3) for grease and grit removal - each 30 ft wide by 50 ft long by 20 ft deep, equipped with diffused aeration equipment.
3. Flocculation tanks (3) - each 30 ft wide by 100 ft long by 20 ft deep and supplied with diffused air for slow mixing to aid in the settling of organic solids.

The north inlet contains most of the domestic, commercial, and industrial wastes from north and east Omaha. The flow enters the plant through the south interceptor force main. Preliminary treatment consists of two grit-removal basins, each 30 ft in diameter.

After preliminary treatment the flow from both the north and south inlets enters a splitter box. Here, the flow can either remain separated or be combined with treatment as follows:

1. Primary clarifiers (8) - each 120 ft in diameter with an 8-ft side water depth and equipped with a surface skimmer. (At design flow each clarifier has a surface overflow rate of 800 gpd/sq ft and a detention time of 1.8 hr.)
2. Anaerobic sludge digestors (5) - each 100 ft in diameter and 40 ft deep with three of the digestors used for primary sludge digestion and two for secondary digestion.
3. Vacuum filters (3) - each 11.5 ft in diameter and 12 ft wide.
4. Sludge drying and incineration - ash sluiced to ash lagoons.

C. DISCUSSION OF IN-PLANT SURVEY AND FINDINGS

From 31 July through 5 August 1972 EPA personnel evaluated the Missouri River Wastewater Treatment Plant. Seven 24-hr composite samples (composited on flow basis) were collected of the north inlet influent, south inlet influent, the combined raw influent, and the final effluent [Figure 1]. Grab samples for oil-and-grease analysis were collected periodically from the north inlet, the south inlet, and the final effluent. From 1 through 3 August 1972 grab samples of the final effluent for bacteriological analysis were collected. Each time a sample was collected, temperature, pH, and conductivity were measured. [Tables 2, 3, 4, and 5 summarize field measurements, organic data, heavy metal data, and bacteriological results, respectively.]

During the survey only three out of the eight clarifiers were being used. Based on the average flow (26.1 mgd) the detention time in each of these clarifiers averaged 1.87 hr, approximately equal to the design detention time (i.e. 1.8 hr). The wastewater was septic (i.e. black coloration and H_2S gas) in the north inlet and clarifiers. The plant personnel were adding hydrogen peroxide to the wastewater in an attempt to correct this problem.

Large accumulations of grease were observed daily on these clarifiers. Skimmers were removing the majority of the grease, but visual observations revealed carry over of the grease into the final effluent, resulting in grease concentrations ranging from 88 to 152 mg/l [Table 3]. The weirs on each clarifier needed cleaning.

TABLE 2

SUMMARY OF FIELD MEASUREMENTS AND FLOW DATA
MISSOURI RIVER WASTEWATER TREATMENT PLANT
30 JULY THROUGH 5 AUGUST 1972

Station Description	Date	Flow mgd	Temp. °C (range)	Conductivity µmhos/cm (range)	pH (range)
North inlet	7/30/72	12.9	25-28	900-2,800	1.5-11.3
	7/31/72	16.2	21-28	650-1,700	6.7-7.4
	8/1/72	12.2	22-32	750-2,600	5.0-8.5
	8/2/72	12.9	21-24	900-1,700	6.8-7.6
	8/3/72	8.5	20-26	600-1,700	6.3-8.8
	8/4/72	2.6	22-29	600-2,600	6.9-7.1
	8/5/72	2.5	29-31	1,700-3,000	5.8-7.3
South inlet	7/30/72	11.9	21-24	1,600-3,500	6.3-8.6
	7/31/72	19.3	20-28	1,050-3,250	6.2-8.3
	8/1/72	18.3	21-26	1,450-3,500	6.5-7.4
	8/2/72	17.5	20-26	1,500-3,000	6.5-7.2
	8/3/72	16.8	20-26	1,450-3,000	6.5-7.2
	8/4/72	17.1	22-27	1,750-3,000	5.6-8.0
	8/5/72	14.3	20-25	1,100-2,500	6.3-7.7
Combined influent	7/30/72	24.8	24-26	1,250-2,300	4.8-11.7
	7/31/72	35.5	21-25	1,100-2,200	6.8-7.4
	8/1/72	30.5	22-26	1,400-2,400	6.5-7.8
	8/2/72	30.4	22-24	1,400-2,400	6.9-7.3
	8/3/72	25.3	21-25	1,550-2,250	6.6-7.5
	8/4/72	19.7	22-26	1,600-2,700	6.9-7.2
	8/5/72	16.8	23-25	1,750-2,300	6.4-7.3
Plant effluent	7/30/72	24.8	24-26	1,400-2,000	2.1-7.1
	7/31/72	35.5	21-28	1,200-2,400	6.8-7.2
	8/1/72	30.5	21-26	1,100-2,300	6.7-7.1
	8/2/72	30.4	22-24	1,000-2,200	6.7-7.1
	8/3/72	25.3	22-24	1,500-2,400	6.7-7.1
	8/4/72	19.7	22-25	950-2,700	6.8-7.0
	8/5/72	16.8	23-24	1,400-2,400	6.0-6.9

TABLE 3

SUMMARY OF CHEMICAL DATA
MISSOURI RIVER WASTEWATER TREATMENT PLANT
30 JULY THROUGH 5 AUGUST 1972

Parameter[a]	North inlet influent	South inlet influent	Combined raw influent[b]	Final effluent	Removal efficiency[c,d] %
BOD					
Range	160-1,000	170-910	360-930	375-700	(-39)-38
Average	450	680	630	480	13
COD					
Range	380-1,900	383-2,080	648-1,980	757-1,090	(-13)-44
Average	900	1,460	1,220	900	24
TOC					
Range	120-480	130-420	160-500	210-310	(-32)-28
Average	240	340	340	250	13
Total Solids					
Range	1,200-2,900	1,470-2,810	1,610-2,640	1,600-2,060	(-10)-21
Average	1,760	2,210	2,100	1,800	9
Suspended Solids					
Range	216-448	248-1,060	348-1,450	328-520	(-27)-55
Average	328	724	835	423	22
VSS					
Range	108-270	192-880	232-938	204-420	(-19)-66
Average	195	563	547	301	25
Settleable Solids ml/l					
Range				2.5-4.2	
Average				3.4	
Oil & Grease[e]					
Range	14-120[f]	78-300		88-152[g]	
Average	41	200		125	
Furfural					
Range	<0.5-25			<0.5-2.3	
Average	13[h]			0.6[h]	

---

[a] All units are mg/l unless otherwise noted.

[b] This sample contains supernatant.

[c] With the exception of VSS, the negative removal efficiencies occurred on Sunday, 30 July 1972.

[d] Numbers in parenthesis indicate that the parameter measured had a higher concentration in the effluent than in the influent.

[e] This is hexane-extractable material.

[f] The range is based on five values.

[g] The range is based on six values.

[h] All values recorded as "less than" have not been used to calculate the average.

TABLE 4

SUMMARY OF HEAVY METALS DATA[a]
MISSOURI RIVER WASTEWATER TREATMENT PLANT
30 JULY THROUGH 5 AUGUST 1972

	Missouri River Treatment Plant Effluent
Mercury (μg/l)	
range	0.6-1.8
average	1.1
Lead	
range	<0.05[b,c]
average	
Zinc	
range	0.411-0.513
average	0.473
Copper	
range	0.026-0.093
average	0.061
Chromium	
range	<0.1[d]-0.4
average	0.2
Cadmium	
range	0.026-0.035
average	0.030

---

[a] All units are mg/l unless otherwise noted.
[b] This represents minimum detectable limits.
[c] All values are the same.
[d] All values recorded as "less than" have not been used to calculate the average.

TABLE 5

BACTERIOLOGICAL RESULTS
MISSOURI RIVER WASTEWATER TREATMENT PLANT AND SELECTED MISSOURI RIVER STATIONS
31 JULY THROUGH 5 AUGUST 1972

Station Description	Date	Time Collected	Total Coliforms	Fecal Coliforms	Fecal Streptococci
Missouri River, upstream of treatment plant effluent (RM 611.87)	7/31/72	0915	24,000	1,000	630
	8/1/72	0615	160,000	7,000	3,600
	8/3/72	1552	83,000	8,000	6,200
	8/4/72	1822	130,000	4,900	
	8/5/72	1400	74,000	4,300	
	Log Mean		79,000	4,100	2,400
Treatment plant effluent (RM 611.58)	8/1/72	1120		21,000,000	630,000
	8/1/72	1220		24,000,000	940,000
	8/2/72	1100		19,000,000	2,100,000
	8/3/72	1100		8,200,000	3,300,000
	8/3/72	1300		16,000,000	870,000
	Log Mean			17,000,000	1,300,000
Missouri River, downstream from treatment plant effluent (RM 611.42)	7/31/72	0940	25,000	1,400	1,200
	8/1/72	0631	270,000	15,000	4,600
	8/3/72	1605	950,000	250,000	69,000
	8/4/72	1850	2,000,000	390,000	>100,000
	8/5/72	1415	1,400,000	290,000	
	Log Mean		450,000	57,000	>14,000

Also during the survey flow-measuring equipment for the north and south inlets was checked. The data indicated that the north inlet recorder was reporting flows less than the actual flow passing through the Parshall flume. A plot of the *measured flow* recorded vs. *head* was made on log-log paper [Figure 2]. A method of least squares was used to fit the values obtained from the flow recorder. This procedure indicated that the recorded flows at the north inlet were 50 percent lower than the measured flow rate. Flows recorded during the survey have been adjusted accordingly.

As noted earlier, the Missouri River plant was designed for daily BOD and suspended-solids loadings of 270,000 and 244,000 lb, respectively. The maximum loads observed (147,000 lb of BOD and 177,000 lb of suspended solids) are well below the design criteria. Approximately 50 percent of the loadings received at the treatment plant are from the Central Wastewater Pretreatment Facility.

During the investigation, removal efficiencies [Table 3] for BOD and suspended solids ranged from minus 39 to 38 percent (average of 13 percent) and minus 27 to 55 percent (average of 22 percent), respectively. Monthly operational data, for the period March 1971 through July 1972 [Tables 6 and 7], were obtained from Missouri River plant officials. The plant data indicated that monthly average BOD and suspended solids removals ranged from minus 34 to 41 percent and from minus 3 to 76 percent, respectively.

These average removal ratios for both the survey and the period of record are less than normally obtained with primary treatment (i.e., 35 percent for BOD and 65 percent for suspended solids). At times the effluent

TABLE 6

MONTHLY CONCENTRATIONS AND REMOVAL EFFICIENCIES OF BIOCHEMICAL OXYGEN DEMAND
MISSOURI RIVER WASTEWATER TREATMENT PLANT
OMAHA, NEBRASKA[a]
MARCH 1971 - JULY 1972

	Flow mgd						BOD									Removal Efficiency[c] (%)	
	North Inlet[b]			South Inlet			North Inlet (mg/1)			South Inlet (mg/1)			Combined Effluent (mg/1)				
	Max.	Avg	Min.	Max.	Avg	Min.	Max.	Avg	Min.	Max.	Avg	Min.	Max.	Avg	Min.	Avg	Range
1971 March	23.8	15.0	3.0	41.7	14.0	1.0	880	580	250	1,540	900	380	1,420	570	100	9	(-93)-70
April	20.0	13.0	5.3	8.4	5.8	2.3	1,280	460	140	980	480	140	980	480	140	21	(-55)-79
May	28.9	9.2	2.2	17.8	5.0	.3	760	400	120	1,460	860	460	1,360	570	360	19	(-58)-51
June	18.0	9.0	1.1	20.0	8.2	2.5	940	672	400	4,320	1,461	600	1,220	733	460	21	(-63)-79
July	16.2	7.0	0.7	16.3	9.0	3.0	880	617	360	5,800	1,623	840	1,180	750	360	24	(-6)-67
Aug.	34.0	13.7	3.8	21.0	9.1	4.3	840	640	440	2,200	1,720	1,240	1,200	1,040	880		88[d]
Sept.	9.2	2.0	0.1	12.1	9.2	5.9	620	316	130	3,040	1,835	1,280	1,880	1,074	400	28	(-57)-85
Oct.	25.4	8.5	2.4	13.8	7.4	3.9	390	258	120	2,680	1,632	1,080	1,480	963	600	(-22)	(-116)-63
Nov.	18.1	7.4	1.4	12.0	7.4	4.5	695	286	70	2,820	1,320	380	2,000	860	320	(-21)	(-160)-69
Dec.	NO DATA AVAILABLE																
1972 Jan.	19.8	14.2	5.0	11.0	6.0	1.8	1,460	572	250	2,920	1,387	480	2,520	829	280	(-1)	(-43)-78
Feb.	18.2	11.4	5.5	6.3	4.9	2.7	1,040	723	200	2,600	1,579	1,000	2,320	1,321	720	(-34)	(-112)-10
March	26.2	15.6	7.5	9.9	5.5	1.6	840	486	260	1,740	1,032	320	1,760	670	170	(-1)	(-133)-60
April	27.9	11.9	4.1	13.3	6.7	2.7	1,160	619	360	2,520	1,153	360	1,480	660	200	19	(-22)-60
May	NO DATA AVAILABLE																
June	19.0	12.0	4.5	9.0	7.4	3.5	720	450	260	2,240	1,438	720	1,440	739	240	15	(-57)-61
July	22.6	10.8	1.9	37.5	10.4	3.2	880	590	200	3,160	1,657	840	1,000	707	400	41	23-73

---

a/ Efficiencies are calculated on the basis of data provided by the Missouri River plant officials.
b/ Based on data obtained during the survey, these flow rates are 50 percent lower than actual flows.
c/ Negative removals indicate that net loadings discharged in the effluent exceed the combined loadings in the influent.
d/ This figure is based on one day's data.

B-12a

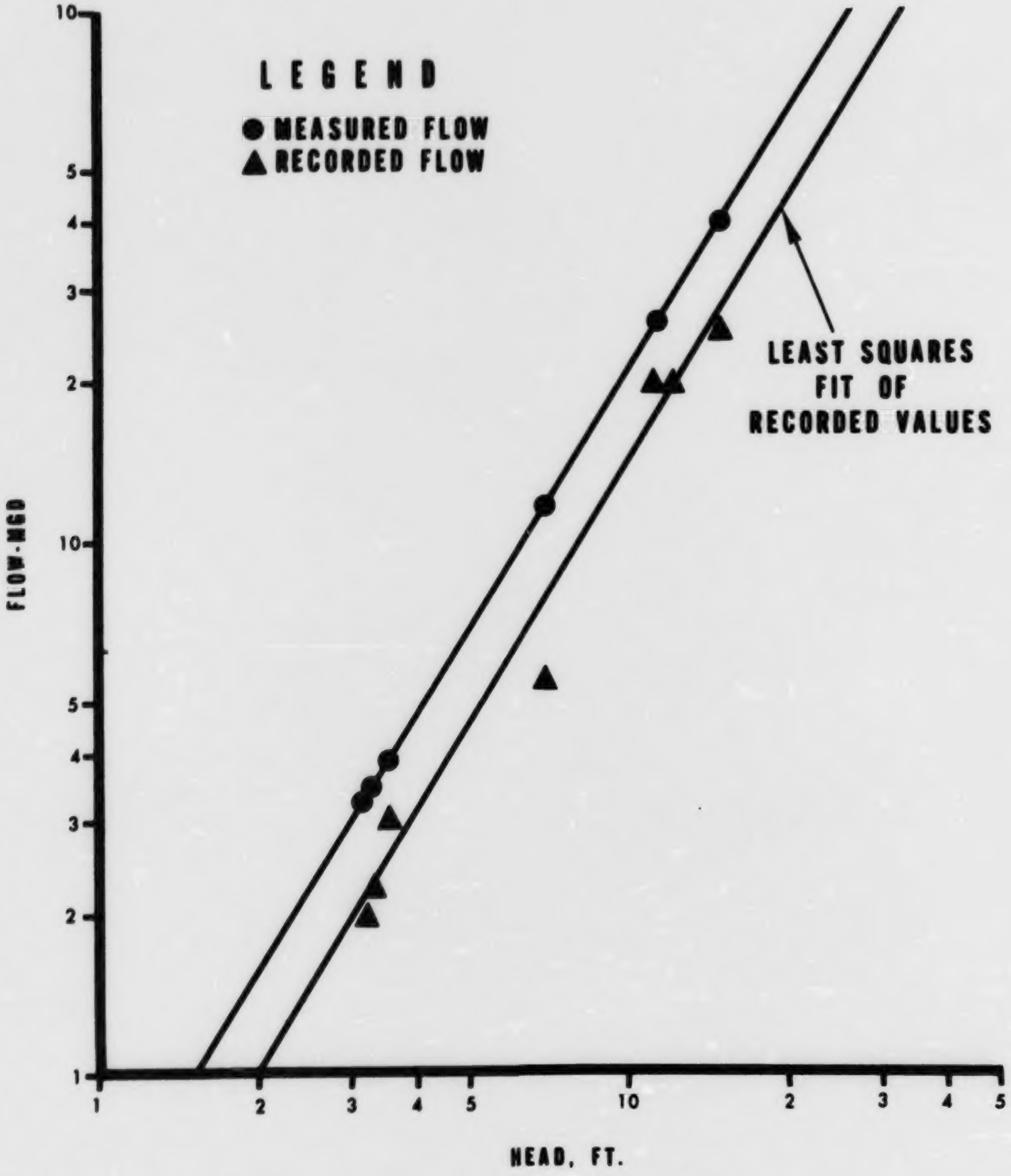


Figure 2. Missouri River Wastewater Treatment Plant-North Inlet Flow
Omaha, Nebraska, August 1972

TABLE 7

MONTHLY CONCENTRATIONS AND REMOVAL EFFICIENCIES OF SUSPENDED SOLIDS MISSOURI RIVER WASTEWATER TREATMENT PLANT-OMAHA, NEBRASKA[a]
MARCH 1971 - JULY 1972

	Flow mgd						Total Suspended Solids									Removal Efficiency[c] (%)	
	North Inlet[b]			South Inlet			North Inlet (mg/l)			South Inlet (mg/l)			Combined Effluent (mg/l)				
	Max.	Avg	Min.	Max.	Avg	Min.	Max.	Avg	Min.	Max.	Avg	Min.	Max.	Avg	Min.	Avg	Range
1971 March	23.8	15.0	3.0	41.7	14.0	1.0	910	350	80	2,040	700	80	340	300	50	48	(-43)-85
April	20.0	13.0	5.3	8.4	5.8	2.3	1,220	290	120	1,540	1,050	220	1,060	270	120	44	(-65)-84
May	28.9	9.2	2.2	17.8	5.0	.3	540	210	60	2,620	960	240	540	270	100	38	(-22)-62
June	18.0	9.0	1.1	20.0	8.2	2.5	1,220	302	60	4,400	1,457	200	1,200	470	220	32	(-90)-78
July	16.2	7.0	0.7	16.3	9.0	3.0	770	314	60	3,340	900	440	480	294	140	49	18-72
Aug.	34.0	13.7	3.8	21.0	9.1	4.3	390	2,090	60	2,100	968	200	430	2,760	140	45	26-63
Sept.	9.2	2.0	0.1	12.1	9.2	5.9	420	137	20	2,180	812	340	1,020	458	100	29	(-79)-68
Oct.	25.4	8.5	2.4	13.8	7.4	3.9	900	216	20	2,040	970	270	1,520	463	160	(-3)	(-167)-97
Nov.	18.1	7.4	1.4	12.0	7.4	4.5	420	192	60	1,080	635	220	610	321	120	21	(-93)-60
Dec.	NO DATA AVAILABLE																
1972 Jan.	19.8	14.2	5.0	11.0	6.0	1.8	500	301	100	900	669	100	530	279	60	29	(-27)-67
Feb.	18.2	11.4	5.5	6.3	4.9	2.7	480	288	120	2,010	804	240	580	351	160	22	(-125)-67
March	26.2	15.6	7.5	9.9	5.5	1.6	640	322	150	4,695	870	400	760	308	160	29	(-75)-82
April	27.9	11.9	4.1	13.3	6.7	2.7	1,540	451	200	2,620	1,543	450	750	340	140	53	(-8)-90
May	NO DATA AVAILABLE																
June	19.0	12.0	4.5	9.0	7.4	3.5	740	250	60	3,420	2,150	420	500	307	200	62	21-88
July	22.6	10.8	1.9	37.5	10.4	3.2	800	305	60	3,660	1,624	380	360	202	90	76	44-95

a/ Efficiencies are calculated on the basis of data provided by the Missouri River plant officials.
b/ Based on data obtained during the survey, these flow rates are 50 percent lower than actual flows.
c/ Negative removals indicate that net loadings discharged in the effluent exceed the combined loadings in the influent.

BOD is equivalent to that of normal raw sewage, i.e., 250 mg/l.

Disinfection of the plant effluent was not provided. As a result, the log mean of fecal-coliform bacterial organisms increased in the Missouri River from 4,100, upstream (RM 611.87) to 57,000/100 ml, downstream (RM 611.42) from the discharge [Table 4]. Both of these bacterial densities violate the Nebraska Water Quality Standards for the Missouri River (i.e., fecal coliform organisms shall not exceed a geometric mean of 1,000/100 ml). If the water-quality criteria had been met upstream of the discharge, the effluent from the Missouri River plant (fecal coliform density of 17,000,000/100 ml) would still have caused a violation of the standards.

According to Kirkham, Michael and Associates,[5/] temperature, pH, total dissolved solids, and toxic substances were reviewed for the wastewater received by the Missouri River plant. None of these were "...expected to cause any significant deleterious effects on treatment efficiencies..."

The pH fluctuation (1.5 to 11.3) observed [Table 2] in the north inlet influent on 30 July 1972 is believed to be a direct result of the discharge from The Quaker Oats Company.* After treatment the pH of the Missouri River plant effluent ranged from 2.1 to 7.1. Neutralization of wastes by contributing sources will need to be enforced in order to prevent damage to the sewers and to the secondary wastewater treatment processes proposed.

---

* Although no sampling was conducted at The Quaker Oats Company on this date, data obtained during the period 3 through 5 August 1972 showed wide fluctuations in the effluent. [For additional information, see Appendix C.]

In addition to the fluctuation in pH and BOD loadings, the discharge from The Quaker Oats Company resulted in furfural concentration in the Pierce Street sewer ranging from 75 to 110 mg/l. The concentration of furfural ranged from less than 0.5 to 2.3 mg/l in the effluent. These concentrations will not cause operational problems in a secondary plant or water-quality degradation in the Missouri River. However, during periods when the Pierce Street Lift Station is by-passing flow to the Missouri River, the concentration of furfural is high enough to be toxic to aquatic life in the immediate vicinity of the discharge. The industrial waste ordinances will need to be enforced to prevent occurrence of these high and low pH values as well as toxic substances.

As indicated earlier, Kirkham, Michael and Associates have completed an engineering report on secondary treatment for the Missouri River WWTP. Based on recommendations contained within the report, City of Omaha City officials plan to construct a completely mixed, activated-sludge treatment system with disinfection. The south inlet flow will receive two-stage secondary treatment, which includes roughing filters and intermediate clarifiers, followed by activated sludge. The new secondary plant, designed for a dry-weather flow of 65 mgd, is to have sufficient hydraulic capacity to pass a 200-mgd wet-weather flow. The effluent discharged from this new plant must meet the requirements of the Federal Water Pollution Control Act Amendments of 1972 which stipulate that for publicly owned treatment works, effluent limitations, based on secondary treatment, must be met by 1 July 1977.*

---

* To meet the requirements of the Act, EPA is currently proposing to limit both BOD and suspended solids, in the effluent, to a monthly average of 30 mg/l and weekly average of 45 mg/l, or 85 percent overall reduction, whichever produces better water quality. This level of treatment is obtainable through secondary treatment. Furthermore, the interim regulations limit the fecal-coliform bacterial density to a weekly average of 400/100 ml and a monthly average of 200/100 ml.

The interim dates [Table 1] relative to construction of the new secondary treatment plant have been met. A construction grant application has been submitted, but information obtained from EPA construction grant personnel, Region VII[6] indicated that the Federal funds will not be available for this grant until at least FY 1975. City officials stated that without adequate funding support the 1975 date would not be met.[7] With the required installation of secondary treatment facilities by 31 December 1975 and of the unavailability, before FY 1975, of construction grant funds, the City of Omaha could make an effort to improve the present primary facilities. There are several possible interim measures [Appendix H, Section B] to improve existing efficiencies at the Missouri River WWTP. These measures could be used until the new plant facilities are operative.

D. SUMMARY AND CONCLUSIONS

1. The Missouri River Wastewater Treatment Plant had a removal efficiency of biochemical oxygen demand ranging from minus 39 percent (increase in BOD) to 38 percent and removal efficiencies of suspended solids ranging from minus 27 percent (increase in SS) to 55 percent. Plant records, over a 14-month period from March 1971 to July 1972, showed average removals from minus 34 to 41 percent for BOD and from minus 3 to 76 percent for suspended solids. Highly soluble BOD and septic clarifiers are considered to be the reason for these low removal rates.

2. The Central Wastewater Treatment Facility contributes approximately 50 percent of the total waste load received by the Missouri River

plant. Any operational problems (i.e., inadequate grease or solids removal) experienced at the pretreatment plant directly affect the operation of the Missouri River plant.

3. The effluent from the Missouri River plant was not disinfected. The high fecal-coliform bacterial density (log mean of 17,000,000/100 ml) increased the concentration in the Missouri River (from 4,100/100 ml, upstream of, to 57,000/100 ml, downstream from the treatment plant discharge). Bacterial densities at both river stations were in violation of the bacterial requirements of the Nebraska Water Quality Standards.

4. The City of Omaha plans, by 31 December 1975, to construct new secondary treatment facilities. The plant will provide a minimum of 90 percent BOD and suspended solids removal plus disinfection. The survey data indicated that, unless steps are taken to control the pH fluctuation, variation in BOD loadings, and the septic conditions of the sewage, there could be operational problems in the biological treatment system.

E. RECOMMENDATIONS

It is recommended that:

1. Industrial wastes discharged to the Missouri River Wastewater Treatment Plant be pretreated in order to remove toxic substances and other pollutants to levels that will not inhibit treatment of the combined wastes by biological treatment systems or pass through the public systems in concentrations or loads inconsistent with effluent limitations and conditions prescribed by permits issued under NPDES.

2. The new secondary treatment facility be placed in operation no later than 31 December 1975, and that it meet the treatment requirements of the Federal Water Pollution Control Act Amendments of 1972.

3. City officials consider the installation of interim measures [Appendix H, Section B] at the Missouri River WWTP until the proposed facilities are constructed.

F. REFERENCES

1/ *Wastewater Collection and Treatment*, Technical Supplement No. 2 to the Comprehensive Water Pollution Control Plant, Omaha-Council Bluffs Metropolitan Area Planning Agency. Henningson, Durham, Richards and Stanley, Consultants. Preliminary submittal. June 1972.

2/ *Summary of Conference on Pollution of Interstate Waters of the Missouri River-Omaha, Nebraska Area (Nebraska, Iowa, Missouri, and Kansas)*. U. S. Public Health Service, U. S. Department of Health, Education, and Welfare. Kansas City, Missouri. June 1957.

3/ *Summary of Progress Evaluation Meeting for Conference on Pollution of the Interstate Waters of the Missouri River in the Omaha, Nebraska Area (Nebraska, Iowa, Missouri, and Kansas)*. U. S. Public Health Service, U. S. Department of Health, Education, and Welfare. Kansas City, Missouri. February 11-12, 1965.

4/ *Water Quality Standards Applicable to Nebraska Waters*, Department of Environmental Control, Lincoln Nebraska. June 20, 1972.

5/ Study and Report on Post-primary Treatment, Missouri River Wastewater Treatment Plant, Kirkham, Michael and Associates. March 1972.

6/ Telephone Conversation with Mrs. Rosalie M. Michelson, Environmental Protection Agency, Region VII. 1000 hours. 29 December 1972.

7/ Gene E. Jordan, Written Communication to Jerome H. Svore, Regional Administrator, Region VII, Environmental Protection Agency. Office of Director, Public Works, City of Omaha. 17 May 1972.

PAPILLION CREEK WASTEWATER TREATMENT PLANT
OMAHA, NEBRASKA

A. GENERAL

Nine municipal wastewater treatment plants [Table 2 in Chapter V] are located in the Papillion Creek watershed. The largest of these, the Papillion Creek Wastewater Treatment Plant which is operated by the City of Omaha, was evaluated by EPA personnel of the National Field Investigations Center-Denver 8 through 10 August 1972. Joseph Van Rycheghem, foreman, and James Swan, plant operations engineer, provided information and assistance.

The Papillion Creek plant is a secondary treatment facility designed with a hydraulic capacity of 18 mgd and an organic load capacity of 24,200 lb per day BOD. The plant was constructed in 1941.

A Conference on the Matter of Pollution of the Missouri River - Omaha, Nebraska, Area was held in 1957.[1/] The Conference concluded that the major source of pollution originated in the Omaha, Nebraska, area nd recommended the expansion of the Papillion Creek plant. As a result, the plant was expanded in 1958 to its present capacity (18 mgd). However, the present flow received at the plant is approximately 26 mgd of which plant officials estimate 15 percent is industrial wastes.

Flow in the combined sewers, during periods of rainfall, exceeds the hydraulic capacity of the treatment units, and, to prevent flooding of the plant, the entire flow is by-passed into Big Papillion Creek.

The plant is staffed with a foreman, an engineer, a chemist, and

23 operators. Eighteen operators are certified as Class 1: the remainder, as Class 2.*

B. WASTEWATER TREATMENT FACILITIES

The principal components for this treatment facility [Figure 1] are:

1. Bar Screen and grit chamber.
2. Primary clarifiers (6) - each 15 ft wide, 65 ft long, and 9.5 ft deep and with a skimmer to remove floating solids.
3. Activated sludge system - 3 aeration basins, each consisting of 2 tanks 120 ft long, 20 ft wide, and 14 ft deep, with the system designed to treat 13 mgd.
4. Aeration basin - flow in excess of 13 mgd receives treatment in this basin consisting of 2 tanks, each 120 ft long, 20 ft wide and 14 ft deep.
5. Secondary clarifier (4) - each 75 ft in diameter with a side water depth of 10 ft, and no skimmers.
6. Sludge digestors (4) - each 53 ft in diameter and 26 ft deep with two primary digestors heated with heat exchangers and two secondary digestors heated with water.
7. Sludge-holding tanks (2) - each 19 ft wide, 25 ft long, and 16 ft deep, receiving both digested sludge and raw sludge and being equipped with air diffusers for mixing and conditioning sludge.
8. Sludge incinerator - waste sludge from this plant, Holling

---

* The City of Omaha has a voluntary certification program for wastewater treatment plant operators. Class 2 is the highest of the two classes of certification.

B-20a

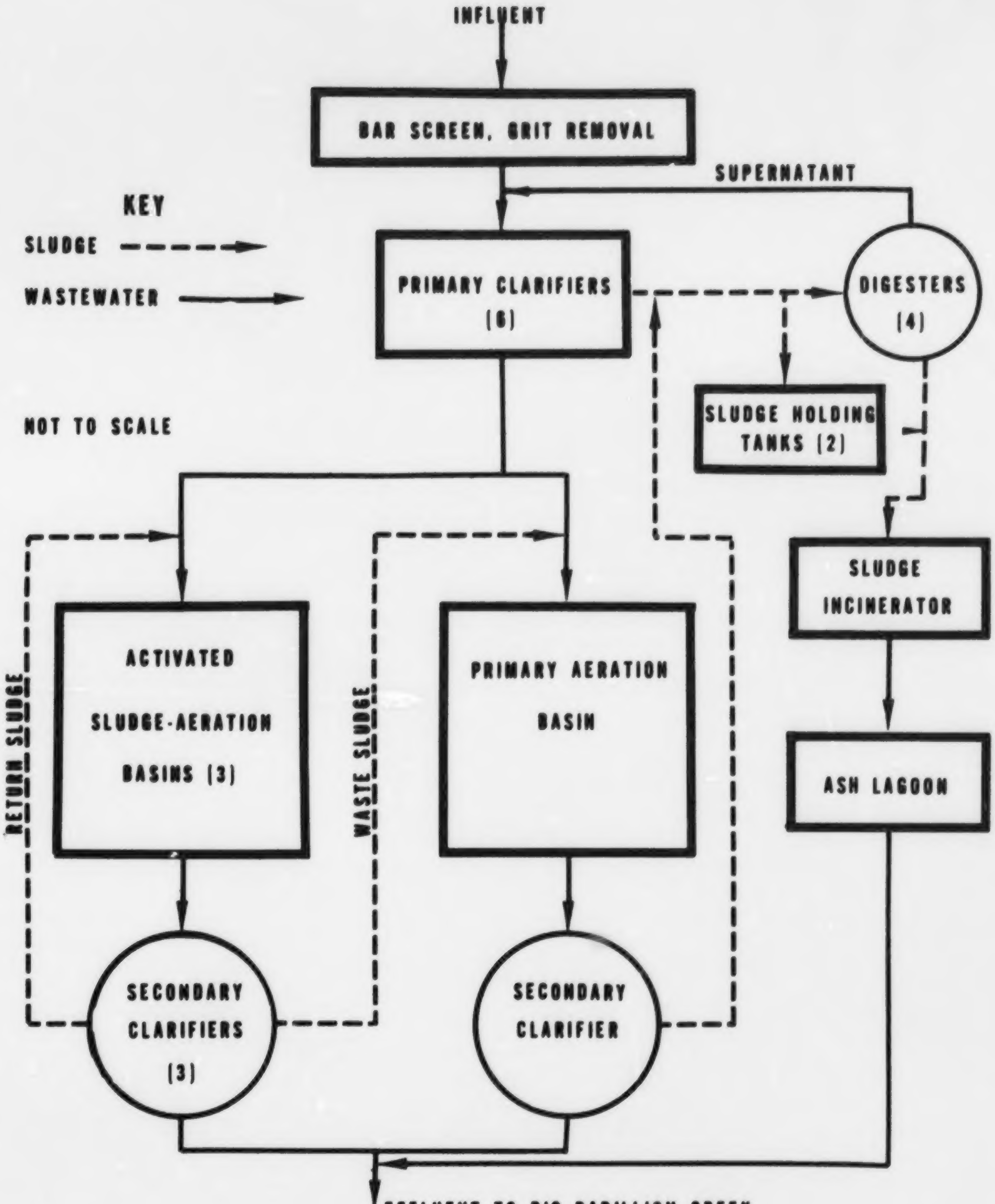

INFLUENT
BAR SCREEN, GRIT REMOVAL
SUPERNATANT
KEY
SLUDGE
WASTEWATER
PRIMARY CLARIFIERS (6)
DIGESTERS (4)
SLUDGE HOLDING TANKS (2)
NOT TO SCALE
SLUDGE INCINERATOR
ACTIVATED SLUDGE-AERATION BASINS (3)
PRIMARY AERATION BASIN
RETURN SLUDGE
WASTE SLUDGE
ASH LAGOON
SECONDARY CLARIFIERS (3)
SECONDARY CLARIFIER
EFFLUENT TO BIG PAPILLION CREEK

Figure 1. Papillion Creek Wastewater Treatment Plant, Omaha, Nebraska

Heights, Oak Hills, Jacobsen, and District 31 plants being incinerated at this facility with ashes disposed of in a lagoon. Effluent from the lagoon is combined with plant effluent. The activated sludge units and secondary clarifiers are divided into three separate systems. Each of these systems, consisting of one aeration basin and one clarifier, functions as a separate secondary plant.

C. DISCUSSION OF IN-PLANT SURVEY AND FINDINGS

The Papillion Creek plant was evaluated 8 through 10 August 1972. Three 24-hour composites (composited on flow basis) were collected of both the influent and combined effluent of the plant. Grab samples of the effluent to Big Papillion Creek were collected once daily for oil and grease analysis. Temperature, pH, and conductivity measurements were made every hour [Table 1]. Flow was obtained from hourly readings of a staff gage near the headworks of the plant.

Daily, during the survey, it was observed that the skimmers on the primary clarifiers, designed for 18 mgd, were submerged, thus allowing floating solids and grease to pass through the plant. Peak hourly flows were in excess of 33 mgd. The secondary activated sludge portion of the plant treated 13 mgd, the design capacity. Any flow in excess of this receives only primary treatment.

Analysis of the data [Table 1] indicates that the plant was hydraulically and organically overloaded by 51 and 46 percent, respectively. As a result, the removal efficiency for BOD ranged from 15 to 23 percent: concentrations of suspended solids in the effluent exceeded influent

TABLE 1

SUMMARY OF FIELD MEASUREMENTS AND ANALYTICAL RESULTS
PAPILLION CREEK WASTEWATER TREATMENT PLANT
8 THROUGH 10 AUGUST 1972

Parameter[a]	INFLUENT range	INFLUENT average	EFFLUENT range	EFFLUENT average	Percent Removal range
Flow (mgd)			25.8[b]-28.6	27.3	
Temperature (°C)	15-20		16-20		
pH	6.6-7.3		6.6-7.0		
Conductivity (µmhos/cm)	625-1,100		750-1,000		
BOD	130-170	155	110-140	125	15-23
COD	375-412	395	273-362	326	9-27
TOC	99-140	116	82-110	94	10-25
Total Solids	797-921	852	746-860	808	2-7
Suspended Solids[c]	160-186	169	168-210	189	(-5)-(-18)
VSS[c]	132-146	141	154-172	165	(-5)-(-27)
Oil & Grease			11-51	28	

---

[a] Unless otherwise noted all units are mg/1.

[b] This figure is based on 22-hour flow, as plant was by-passing all flow for 2 hours due to rain.

[c] Effluent concentration is higher than influent concentration, resulting in negative removal efficiency.

concentrations on all three days. The treatment provided at this plant was less than that normally expected from primary treatment. There was no disinfection. These conditions constitute violations of the Nebraska Water Quality Standards which requires a minimum of secondary treatment and adequate disinfection.

Water quality degradation in Big Papillion Creek was evident from visual observations (i.e. increased turbidity, sludge blankets, floating matter, etc.) and decreased concentrations of dissolved oxygen. Grab samples collected of Big Papillion Creek upstream (RM 596.60/8.30/4.82) and downstream (RM 596.60/8.30/4.16) from the plant discharge revealed that the DO was reduced from a range of 5.6 to 9.2 mg/l to 1.2 to 4.4 mg/l, espectively.

The City of Omaha [Table 2] plans to construct a new secondary treatment facility by 31 December 1975.* The new plant will be located adjacent to the Missouri River near the mouth of Papillion Creek and will treat wastewaters from the Holling Heights plant, Oak Hills plant, Jacobson plant, District 31 plant, Bellevue Plant No. 2, La Vista, Offutt Air Force Base plant and possibly those from the present Papillion Creek plant. Interceptor lines are currently under construction from the mouth of Papillion Creek upstream to the present Papillion Creek plant. Additional interceptors will be built to intercept wastewater from other plants [Table 2].

The design engineers - Henningson, Durham, and Richardson[2/] - have recommended construction of a 70-mgd trickling filter-activated sludge

---

* The Nebraska Water Quality Standards require municipal and industrial waste discharges into the Missouri River to receive secondary treatment, or its equivalent, plus disinfection by 31 December 1975.

TABLE 2

CITY OF OMAHA
SCHEDULE OF PROJECTS PROVIDING SECONDARY TREATMENT OF MUNICIPAL AND INDUSTRIAL WASTES

Project Description	Engineering Report	Financing Arrangements[a]	Final Plans & Specifications	Award of Construction Contract	Completion of Project
Papillion Creek Interceptor Sewer Phase I, Missouri River to Highway N-870 (NEBR-308)[b]	2/6/67	9/28/71	8/71	10/11/71	5/73
Phase II, Highway N-370 to 60th Street and Harrison St. (NEBR-308)[b]	2/6/67	1/1/72	12/71	4/72	5/73
Benson-Westside Interceptor Sewer, 60th and Harrison St. to 83rd and Seward St.	2/6/67	1/1/72	12/72	3/73	7/74
West Branch Papillion Creek Interceptor Sewer, Papillion Creek to 132nd and "Q" St.	2/6/67	1/1/72	12/72	3/73	7/74
Papillion Creek Treatment Plant[c]	5/72	1/1/72	1/73	4/73	10/75

---

[a] All financing arrangements are contingent upon Federal payment of 55 percent of eligible cost and State payment of 25 percent of eligible cost. This is assured now for only Projects 1 and 2.

[b] This is the Construction Grant designation.

[c] The construction of the Papillion Creek Wastewater Treatment Plant will be completed in phases. It is expected that the first phase, site preparation, will be placed under contract in August 1972.

treatment plant, based on projected 1995 flows. The plant would consist of the following:

1. Preliminary treatment - trash racks (4) and Grit-Grease-Pre Aeration tanks (4);
2. Primary treatment - twelve clarifiers, each 115 ft in diameter;
3. Secondary treatment - eight trickling filters, each 180 ft in diameter; eight aeration tanks, each 50 ft wide and 260 ft long; and eight final clarifiers, each 145 ft in diameter;
4. Sludge digestion - anaerobic digestion followed by incineration;
5. Disinfection - chlorination and detention in two tanks each 110 ft in diameter with 9-ft side water depth.

The effluent discharged from this plant should meet the requirements of the Federal Water Pollution Control Act Amendments of 1972 which stipulate that for publicly owned treatment works, effluent limitations, based on secondary treatment, must be met.*

Interim dates [Table 2] relative to construction of the new secondary treatment plant have been met. The new plant will be built in three phases--35, 15, and 20 mgd, respectively. Construction grants have been approved for the first two phases with anticipated completion 360 days after the awarding of the grant.[3/] [The grant is to be made from FR 1973 and 1974 monies.] Also, the City is presently considering an additional bond issue (financed by increased sewer rates) to cover part of the cost of the second phase of the plant (15 mgd). Thus, a 50-mgd plant should be operative by the 31 December 1975 deadline. A grant application has been made for the third phase; however no funds will be available for this project until at least FY 1975. City officials stated that without adequate funding support the 1975 date could not be met.[4/] With the unavailability of funds some effort could be made to improve the existing plant facilities. Interim treatment measures [such as these discussed in Appendix H, Section C] could improve present plant removal efficiencies.

---

* To meet the requirements of the Act, EPA is currently proposing to limit both BOD and suspended solids in the effluent to a monthly average of 30 mg/l and weekly average of 45 mg/l, of 85 percent overall reductions, whichever produces better water quality. This level of treatment is obtainable through secondary treatment. Furthermore, the proposed regulations limit the fecal-coliform bacterial density to a weekly average of 400/100 ml and a monthly average of 200/100 ml.

D. SUMMARY AND CONCLUSIONS

1. The Papillion Creek Wastewater Treatment Plant was hydraulically and organically overloaded by more than 51 and 46 percent, respectively.

2. During the survey the BOD removal efficiency ranged from 15 to 23 percent which is less than would be expected from a properly functioning primary plant.

3. Disinfection of the effluent was not being provided.

4. The plant discharge caused water-quality degradation in Big Papillion Creek. The DO concentration was reduced from a range of 5.6-9.2 mg/l, upstream, to 1.2-4.4 mg/l downstream from the point of discharge.

5. A new wastewater treatment plant to be constructed by 31 December 1975 will be designed to treat the wastewaters presently treated by the Holling Height plant, Oak Hills plant, Jacobson plant, District 31 plant

Bellevue Plant No. 2, La Vista, Offutt Air Force Base plant, and possibly the Papillion Creek plant. According to the consultants' report, the plant will produce an effluent containing 35 mg/l or less each of BOD and suspended solids. This will not meet the secondary treatment guidelines to be proposed by EPA.

E. RECOMMENDATIONS

It is recommended that:

1. Wastes discharged to publicly owned treatment works be pretreated to remove toxic substances and other pollutants to levels that will not inhibit treatment of the combined wastes or pass through the public systems in concentrations or loads inconsistent with effluent limitations and conditions prescribed by permits issued under NPDES.

2. The new Papillion Creek Wastewater Treatment plant be placed in operation no later than 31 December 1975. This new plant shall meet the treatment requirements of the Federal Water Pollution Control Act Amendments of 1972.

3. Until the proposed facilities are constructed, City of Omaha officials consider the installation of interim measures at the existing Papillion Creek WWTP [such as those in Appendix H, Section C].

F. REFERENCES

1/ *Summary of the Conference on Pollution of Interstate Waters of the Missouri River - Omaha, Nebraska Area (Nebraska, Iowa, Missouri, and Kansas).* U. S. Public Health Service, Department of Health, Education, and Welfare. Kansas City, Kansas. June 1957.

2/ *Papillion Creek Water Pollution Control Plant*, Design Report, Hennington, Durham and Richardson, Omaha, Nebraska. March 1972.

3/ Telephone Conversation with Mrs. Rosalie M. Michelson, Environmental Protection Agency, Region VII. 1000 hours. 29 December 1972.

4/ Gene E. Jordan, Written Communication to Jerome H. Svore, Regional Administrator, Environmental Protection Agency Region VII, Office of Director, Public Works, City of Omaha. 17 May 1972.

APPENDIX C

INDUSTRIAL PLANT REPORTS

ALLIED CHEMICAL CORPORATION
AGRICULTURAL DIVISION
P.O. BOX 7354
OMAHA, NEBRASKA 68107

A. GENERAL

The Allied Chemical Corporation plant, located south of Omaha, manufactures fertilizer. Natural gas, from Oklahoma and Texas, is used to produce hydrogen and carbon dioxide. With pure iron as the catalyst, nitrogen, obtained from the atmosphere, is converted to ammonia (in the Haber process) by reacting it with the hydrogen. Products manufactured at this plant include liquid nitrogen fertilizer (1,250 ton/day), urea (450 ton/day), nitric acid (290 ton/day), anhydrous ammonia (610 ton/day), and ammonium nitrate (360 ton/day). All the nitric acid produced is converted to ammonium nitrate. The principal product marketed, "Golden Uran," contains 34.8 percent urea and 45.1 percent ammonium nitrate, which is equivalent to 32 percent total nitrogen. The plant operates continuously and employs 250 people.

The original ammonia section (referred to as Train No. I) and the urea sections of the plant were constructed in 1954. The nitric acid and ammonium nitrate sections were added in 1956. The modern ammonium section (referred to as Train No. II) was placed in operation in 1965.

From 7 through 11 August 1972 EPA personnel of the National Field Investigations Center-Denver evaluated water-pollution control practices. C. G. Swanson, Jr., assistant to the manager, provided information and assistance.

A study conducted by the Environmental Protection Agency, Region VII, in April 1971, disclosed that the effluent contained 105 to 120 mg/l of NH_3-N and 30 to 500 µg/l of copper. Based on these results, EPA officials concluded that the discharge contained 2,500 lb/day of NH_3-N and that the discharge of heavy metals could be reduced by installing a closed-circuit cooling-water system. However, specific recommendations were not offered.

The Refuse Act permit application states that the average daily discharge (19.7 mgd) to the Missouri River contains 86 mg/l of suspended solids, 80 mg/l of NH_3-N, and 2 mg/l of oil and grease.

B. WATER SUPPLY AND USES

Water used within the plant, approximately 20 mgd, is obtained from 20 wells ranging in depth from 91 to 146 feet. The water is used for once-through cooling, steam generation, sanitary service, internal plant consumption (e.g., some steam is used in the hydrogen-producing process), and for scrubbing gases from the ammonium nitrate process. Mr. Swanson provided water-balance information for all processes, [Figure 1.].

All water is chlorinated and phosphate is added to the cooling water. Boiler feed water treatment consists of the addition of lime, sand filtration, and zeolite ion exchange.

C. WASTE SOURCES AND TREATMENT

Wastewater generated within the plant consist of once-through cooling water, air-scrubber discharge from ammonium nitrate operation, and

C-2a

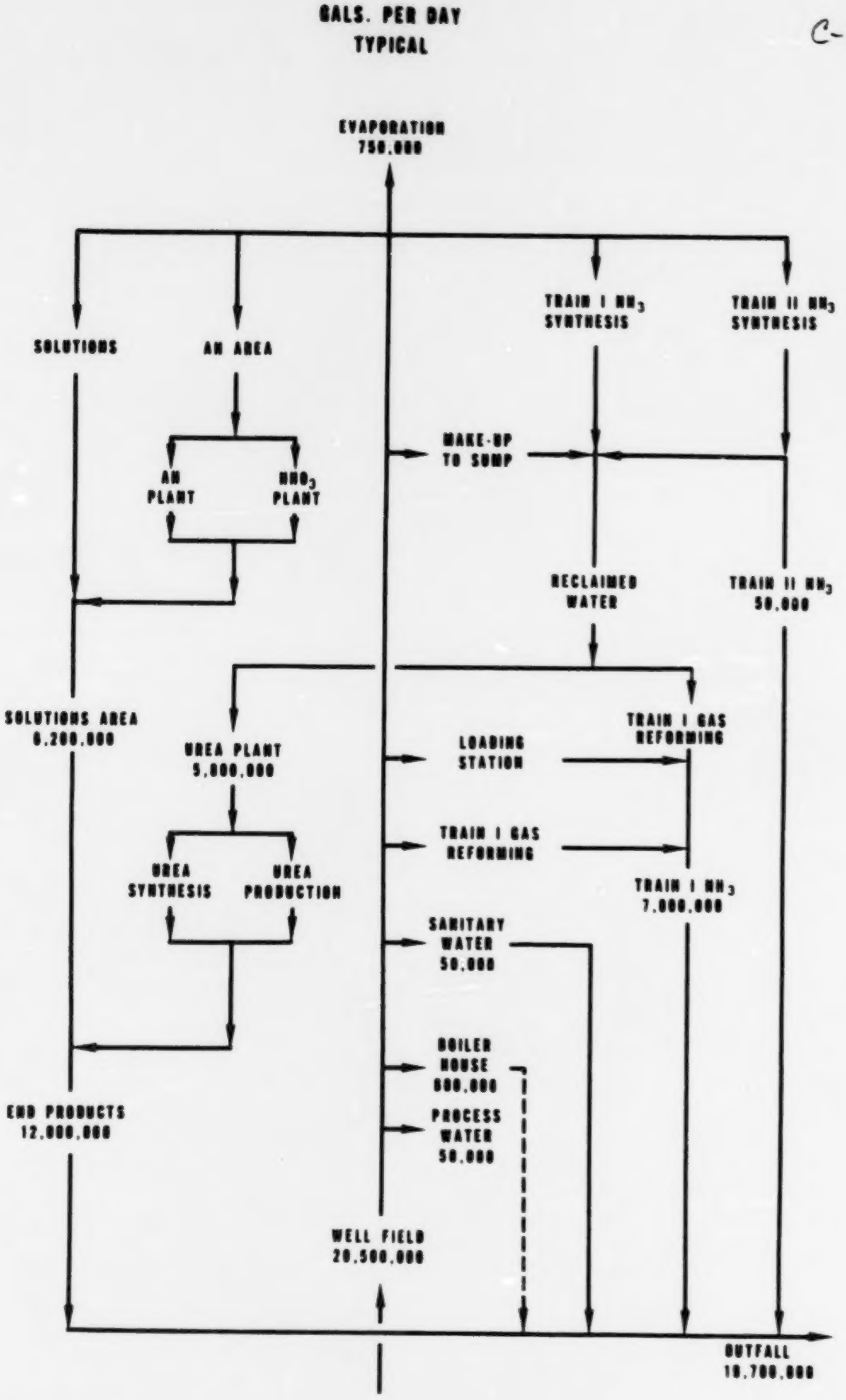

GALS. PER DAY
TYPICAL
EVAPORATION
750,000
SOLUTIONS
AN AREA
TRAIN I NH3
SYNTHESIS
TRAIN II NH3
SYNTHESIS
AN
PLANT
HNO3
PLANT
MAKE-UP
TO SUMP
RECLAIMED
WATER
TRAIN II NH3
50,000
SOLUTIONS AREA
6,200,000
UREA PLANT
5,000,000
TRAIN I GAS
REFORMING
LOADING
STATION
TRAIN I GAS
REFORMING
UREA
SYNTHESIS
UREA
PRODUCTION
TRAIN I NH3
7,000,000
SANITARY
WATER
50,000
BOILER
HOUSE
800,000
PROCESS
WATER
50,000
END PRODUCTS
12,000,000
WELL FIELD
20,500,000
OUTFALL
10,700,000

Figure 1. Total Water Balance, Omaha Plant, Allied Chemical Corporation July, 1972

cooling-water blowdown and condensate. Sources of wastewater discharge include: (1) solutions area (includes wastes from solutions, ammonium nitrate, and nitric acid plants); (2) urea plant; (3) Train I; and (4) Train II. All wastewaters are combined and discharged into the Missouri River (RM 695.26) without treatment through a drainage ditch [Figure 2]. Company officials stated that at present there are no plans to construct waste-treatment facilities.

D. DISCUSSION OF IN-PLANT SURVEY AND FINDINGS

The waste-source survey at Allied Chemical Corporation was conducted 7 through 11 August 1972. On 31 July 1972 W. P. Chamberlain, plant manager, granted permission (written) to sample the wastewater discharges.

Twenty-four-hr composite samples (composited on an equal-volume basis) were collected manually from five positions within the plant, the final effluent, and two Missouri River Stations [Figure 2]. Grab samples were collected periodically from the final effluent for oil-and-grease analysis. Chain-of-custody procedures were continuously maintained on the samples from the final effluent and the river stations [Appendix E]. Temperature, pH, and conductivity were measured each time a sample was taken. EPA personnel also made flow measurements. [Tables 1, 2, and 3 summarize the data.*]

Owing to operational problems, Train II was shut down at 2400 hr 8 August 1972. An attempt was made to start up operations again at 1940

---

* Because of a sampling error, samples collected on 7 ugust 1972 were not analyzed.

TABLE 1

SUMMARY OF FIELD MEASUREMENTS AND ANALYTICAL DATA
ALLIED CHEMICAL CORPORATION
7 through 11 August 1972

Map Key[a]		PARAMETERS[b]									
		Flow (mgd)	Temp (°C)	Conductivity (µmhos/cm)	pH	COD	TOC	Total Solids	Suspended Solids	VSS	Oil & Grease[c]
b	Allied Chemical effluent from nitric acid, ammonia nitrate, and process operation	2.4-3.5	22-34	625-3,000	6.2-10.1	6.8-57	4-47	737-936	14-21	4-5	
c	Allied Chemical effluent from urea process	6.8-8.3	23-32	725-1,500	7.0-11.5	20-51	16-37	453-614	30-52	10-20	
d	Allied Chemical effluent from Train I	9.3-9.5	31-43	500-1,500	5.5-9.2	17-21	5-7	546-598	29-33	6-8	
e	Allied Chemical effluent from Train II	0.294-0.347	29-40	690-1,800	6.6-9.5	23-110	6-22	710-928	17-21	7-15	
a	Allied Chemical well	20.5[d]	13-17	460-1,100	6.8-8.3	16-20	2-14	471-564	5-26	2-8	
g	Missouri River, upstream of Allied Chemical (RM 595.32)		20-25	380-750	6.8-8.6	23-89	5-10	596-744	102-172	18-48	
f	Allied Chemical effluent to river (RM 592.26)	20.1-20.5	28-38	675-1,300	6.6-9.4	24-25	11-21	607-707	38-51	7-32	17-1,100
h	Missouri River downstream (RM 595.20)		20-25	380-750	6.9-9.0	21-74	5-7	610-719	59-133	5-42	2[e]

---

a/ For location see Figure 2.
b/ All units are in mg/l, unless otherwise noted.
c/ This is hexane-extractable material.
d/ Estimated, all values are the same.
e/ This number is based on one value.

C-4a

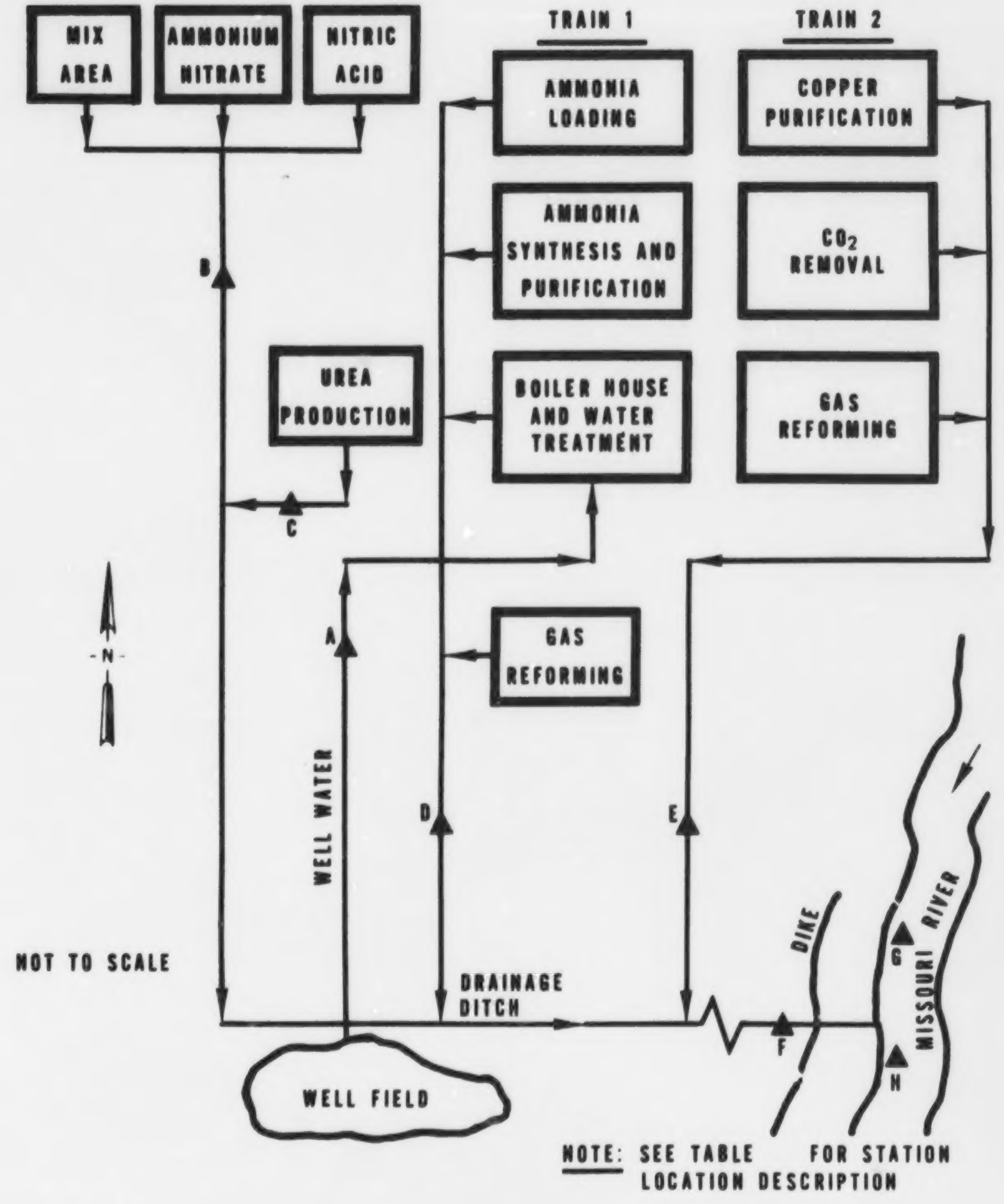

MIX AREA
AMMONIUM NITRATE
NITRIC ACID
TRAIN 1
TRAIN 2
AMMONIA LOADING
COPPER PURIFICATION
AMMONIA SYNTHESIS AND PURIFICATION
CO_2 REMOVAL
UREA PRODUCTION
BOILER HOUSE AND WATER TREATMENT
GAS REFORMING
B
C
A
N
GAS REFORMING
WELL WATER
D
E
DIKE
MISSOURI RIVER
G
NOT TO SCALE
DRAINAGE DITCH
F
H
WELL FIELD
NOTE: SEE TABLE FOR STATION LOCATION DESCRIPTION

Figure 2. Sampling Locations for Omaha Plant, Allied Chemical Corporation, La Platta, Nebraska

TABLE 2

SUMMARY OF NUTRIENTS DATA - ALLIED CHEMICAL CORPORATION
7 through 11 August 1972

Map Key[a]	Station Description	PARAMETER Total Kj-N mg/1	NH$_3$-N mg/1	Organic-N mg/1	NO$_3$+NO$_2$-N mg/1	Total P mg/1
b	Allied Chemical effluent from nitric acid, ammonia nitrate, and process operations	66.8-160	51.7-80.0	15.1-94.1	42.0-59.5	
c	Allied Chemical effluent from urea process	172-210	154-164	8.0-56.0	3.39-3.72	
d	Allied Chemical effluent from Train I	19.5-30.1	14.8-29.5	0.6-5.3	3.23-3.70	
e	Allied Chemical effluent from Train II	25.0-80.3	24.0-78.8	1.0-9.1	11.0-11.6	
a	Allied Chemical well	5.70-5.90	3.31-4.50	1.25-2.48	2.48-3.23	
g	Missouri River, upstream of Allied Chemical (RM 695.32)	0.55-0.93	<0.01-0.06	0.55-0.92	0.36-0.47	0.09-0.15
f	Allied Chemical effluent to river (RM 695.26)	100-116	70.8-82.2	17.8-41.2	17.1-23.0	0.43-0.55
h	Missouri River, downstream from Allied Chemical (RM 595.20)	1.20-6.25	0.42-2.37	0.78-4.69	0.47-1.08	0.11-1.18

---

[a] For location see Figure 2.

TABLE 3

SUMMARY OF HEAVY METALS DATA
ALLIED CHEMICAL CORPORATION
7 through 11 August 1972

Station Description	PARAMETERS[a,b]							
	Mercury (ug/l)	Lead[c]	Zinc	Copper	Chromium	Cadmium	Nickel	Silver[c]
Allied Chemical effluent from nitric acid, ammonia nitrate, and process operations	0.5-0.7	<0.05	0.152-0.350	0.021-0.238	<0.1[c]	0.007-0.012	<0.02-0.02	<0.06
Allied Chemical effluent from urea process	<0.02-0.6	<0.05	0.141-0.203	0.023-0.138	<0.1[c]	0.006-0.13	<0.02-0.03	<0.06
Allied Chemical effluent from Train I	<0.02-1.0	<0.05	0.123-0.154	0.063-0.174	<0.1[c]	0.012-0.023	<0.02-0.03	<0.06
Allied Chemical effluent from Train II	<0.2-1.1	<0.05	0.268-0.382	0.271-3.52	<0.1-1.3	0.013-0.028	<0.02-0.03	<0.06
Allied Chemical well	<0.2-0.8	<0.05	0.136-0.226	0.012-0.066	<0.1[c]	0.007-0.011	<0.02[c]	<0.06
Missouri River, upstream of Allied Chemical (RM 695.32)	<0.2[c]	<0.05	0.155-0.249	0.022-0.066	<0.1-0.3	0.010-0.015	<0.02-0.02	<0.06
Allied Chemical effluent to river (RM 595.26)	<0.2-0.5	<0.05	0.137-0.224	0.047-0.244	<0.1[c]	0.002-0.007	<0.02-0.02	<0.06
Missouri River, downstream from Allied Chemical (RM 595.20)	<0.2-0.4	<0.05	0.178-0.198	0.020-0.067	<0.1[c]	0.005-0.015	<0.2[c]	<0.06

---

[a] All units are mg/l except where noted.

[b] All data values shown as "<" are minimum detectable amounts.

[c] All values are the same.

hr 9 August 1972, but compressor problems developed. Train II was immediately shut down again. The effluent during the period was primarily cooling-water blowdown. At 2210 hr 10 August 1972 a blue-green color was observed in the effluent from Train II. A grab sample was collected, and company officials were notified. According to the Allied officials, the color was the result of a copper-acetate spill from a pump packing located in Train II. Results of the grab sample indicated that the effluent contained, at that time, 66.9 mg/l of copper. The effects of the spill were also noted in the 24-hr composite samples from Train II and the final effluent which showed concentrations of 3.52 and 0.24 mg/l, respectively [Table 3]. This spill resulted in at least 40 pounds of copper being discharged into the Missouri River. However, it occurred during the period when samples were not being collected from the river stations, and therefore, an increase in concentrations was not detected.

The effluent from the Allied Chemical Corporation significantly increases the concentration of nitrogen in the Missouri River. For example, the measured NH_3-N concentration ranged from greater than 0.01 to 0.06 mg/l upstream and from 0.42 to 2.37 mg/l downstream of this discharge [Table 2]. The maximum NH_3-N concentration observed (2.37 mg/l) in the Missouri River downstream from the discharge resulted at a pH greater than 8.4; therefore, a violation of the Nebraska Water Quality Standards [Appendix A] occurred.

In-plant sampling revealed that more than 70 percent of the ammonia load being discharged by Allied Chemical originated from the urea process. The flow from this process comprises less than 37 percent of the total waste flow.

The effluent contained from 17-1100 mg/l of oil and grease and from 38-51 mg/l of suspended solids [Table 1]. Samples collected downstream from the effluent channel in the Missouri River did not reflect an increase in the concentration of these parameters; however, oil was visible on the water surface.

The Nebraska Water Quality Standards established a compliance date of 31 December 1975, at which time the industry was to provide the equivalent of secondary treatment. An effluent containing not more than 20 mg/l of suspended solids; 20 mg/l of total Kjeldahl nitrogen (as N); and 10 mg/l of oil and grease, and with the pH between 6.5 and 9.0 is obtainable by installation of best practicable control technology currently available for this industry.

E. SUMMARY AND CONCLUSIONS

1. The Allied Chemical Corporation discharge of untreated wastewater into the Missouri River, an interstate stream, resulted in violation of the Nebraska Water Quality Standards for ammonia.

2. The discharge from the urea process contained 70 percent of the ammonia load discharged (13,500 lb/day). The flow from this process was less than 37 percent of the total flow.

3. The State of Nebraska has required the Allied Chemical Corporation to construct treatment facilities in order to provide the equivalent of secondary treatment, by 31 December 1975, of wastewaters discharged to the Missouri River.

F. RECOMMENDATIONS

It is recommended that, based on best practicable control technology and present production rates, the effluent limitations to be prescribed for the permit to Allied Chemical Corporation include the following:

1. The suspended solids discharged shall not exceed 20 mg/l or 160 lb/day, whichever is less.

2. The total Kjeldahl nitrogen (ammonia plus organic nitrogen) discharged shall not exceed 20 mg/l or 140 lb/day, whichever is less.

3. The nitrite-nitrate nitrogen shall not exceed 10 mg/l or 45 lb/day, whichever is less.

4. The oil and grease discharged shall not exceed 10 mg/l or 65 lb/day, whichever is less.

5. The pH shall be between 6.5 and 9.0.

6. No toxic or hazardous material, as designated under the provisions of Section 307 of The Federal Water Pollution Control Act as amended, or known to be hazardous or toxic by the permittee, shall be discharged except with the approval of the Administrator (EPA) or his designee.

CENTRAL WASTEWATER PRETREATMENT FACILITY
OMAHA, NEBRASKA

A. GENERAL

The Central Wastewater Pretreatment Facility (also known as the Carver-Greenfield Plant) was placed in operation October 1969 in order to provide pretreatment of wastes from 19 packing houses of which 6 have since ceased operations. Wastewater (containing paunch manure, fat, grease, and blood) from the remaining 13 packing houses [Table 1] is carried by a separate sewer to the pretreatment facility.

Data provided by the City of Omaha indicated that the total head killed of cattle* were as follows: 1971, 1 January to 30 June - 798,187 and 1 July to 31 December - 761,179; and 1 January to 30 June 1972 - 779,898.

The pretreatment facility operates continuously and is staffed with 21 operators (including maintenance personnel), 4 persons involved in the disposal of solids and grease, and an administrator. The facility was evaluated 30 July through 5 August 1972 by personnel of the EPA National Field Investigations Center-Denver. Charles Geisler, City sanitary engineer, provided information and assistance.

A Conference on the Matter of Pollution of the Missouri River - Omaha, Nebraska Area, held in June 1957, recommended that the wastewater, from the meat-packing industries in South Omaha, which contained grease, bone, hair, and paunch manure receive pretreatment by each industry prior to being discharged into the City sewer.

---

* Slaughter houses do not report numbers of sheep and hogs processed.

TABLE 1

PACKING-HOUSE OPERATIONS DISCHARGING TO THE CENTRAL WASTEWATER PRETREATMENT FACILITY

Union Packing Company
4501 South 36th Street
Omaha, Nebraska

E. W. Kneip Company
4401 South 36th Street
Omaha, Nebraska

Wilson Certified Foods, Inc.
27th & "Y" Street
Omaha, Nebraska

American Beef Packers, Inc.
25th & "Z" Street
Omaha, Nebraska

O'Neill Packing Company, Inc.
Box 7194
4801 South 38th Street
Omaha, Nebraska

Midwest Packing Company
3120 "G" Street
Omaha, Nebraska

Cornhusker Packing Company
4436 Dahlman
Omaha, Nebraska

Nebraska-Iowa Dressed Beef Company
P. O. Box 7203, South Omaha Station
Omaha, Nebraska 68107

Sioux Beef Company
P. O. Box 7183
4003 Dahlman
Omaha, Nebraska

Greater Omaha Packing Company
5102 South 26th Street
Omaha, Nebraska

Morris Beef Company
5941 South 25th Street
Omaha, Nebraska

Omaha Dressed Beef Company
4640 South 31st Street
Omaha, Nebraska

Armour & Company
5025 South 33rd Street
Omaha, Nebraska

During the second session of the Conference, the conferees agreed to accept the proposal by the City of Omaha whereby the municipality would finance and build a pretreatment plant to treat all packing-house wastewaters prior to their being discharged into the City sewers. It was recommended that this new pretreatment plant, now known as the Central Wastewater Pretreatment Facility, be completed and in operation by 15 December 1966. This deadline was not met.

During progress evaluation meetings, held in 1965, 1966, and 1967, the conferees discussed requirements for the effluent from the new pretreatment facility. It was recommended that "suspended solids in the Missouri River Sewage Treatment Plant influent should not exceed 400 parts per million" and that the maximum grease load received at the south inlet* should not exceed 18,000 lb/day. During a progress evaluation meeting on 29 March 1966 the public works director for the City of Omaha stated "...from a technical standpoint the proposed collection and treatment facilities will adequately treat the packing wastes so that subsequent treatment, at the Missouri River Sewage Treatment Plant, of the wastes will result in the discharge to the Missouri River of a normal primary treatment plant effluent."

In addition to the pretreatment facility, a by-products plant employing the Carver-Greenfield process for continuous dehydration of grease and paunch manure was constructed. The City expected that financial aid for the pretreatment plant would be forthcoming from funds obtained from the sale of by-products yielded by the Carver-Greenfield process. The process did not prove successful, and only the pretreatment units have been operative since 14 August 1970.

---

* Wastes from the pretreatment plant enter the south inlet of the Missouri River WWTP through the Monroe Street Lift Station.

The City of Omaha has adopted an Industrial Waste Ordinance. It requires that any industrial waste discharged into a municipal sewer shall not contain more than 400 mg/l of suspended solids. In addition, the discharge shall not contain gut casings, fleshings, entrails, paunch manure, hair, or bone.

B. WASTEWATER TREATMENT FACILITIES

The principal components for the pretreatment facility [Figure 1] are:

1. Bar screens (2) in parallel.
2. Gravity separation basins (4) - each 20 ft wide, 50 ft long, an average of 12 ft deep, and with a bottom collection system to remove the settled solids and a skimmer to remove floating material.
3. Air flotation basins (4) - each 20 ft wide, 100 ft long, an average of 12 ft deep, and with a bottom collection system to remove settled solids and a skimmer to remove any floating material.
4. Pressure retention tanks (4) - in which air is dissolved into the recycled wastewater prior to being returned into the air flotation basins.

The effluent is discharged, through the Monroe Street Lift Station, to the south inlet of the Missouri River plant. Grease and paunch manure removed in the pretreatment units are land filled.

C-14a

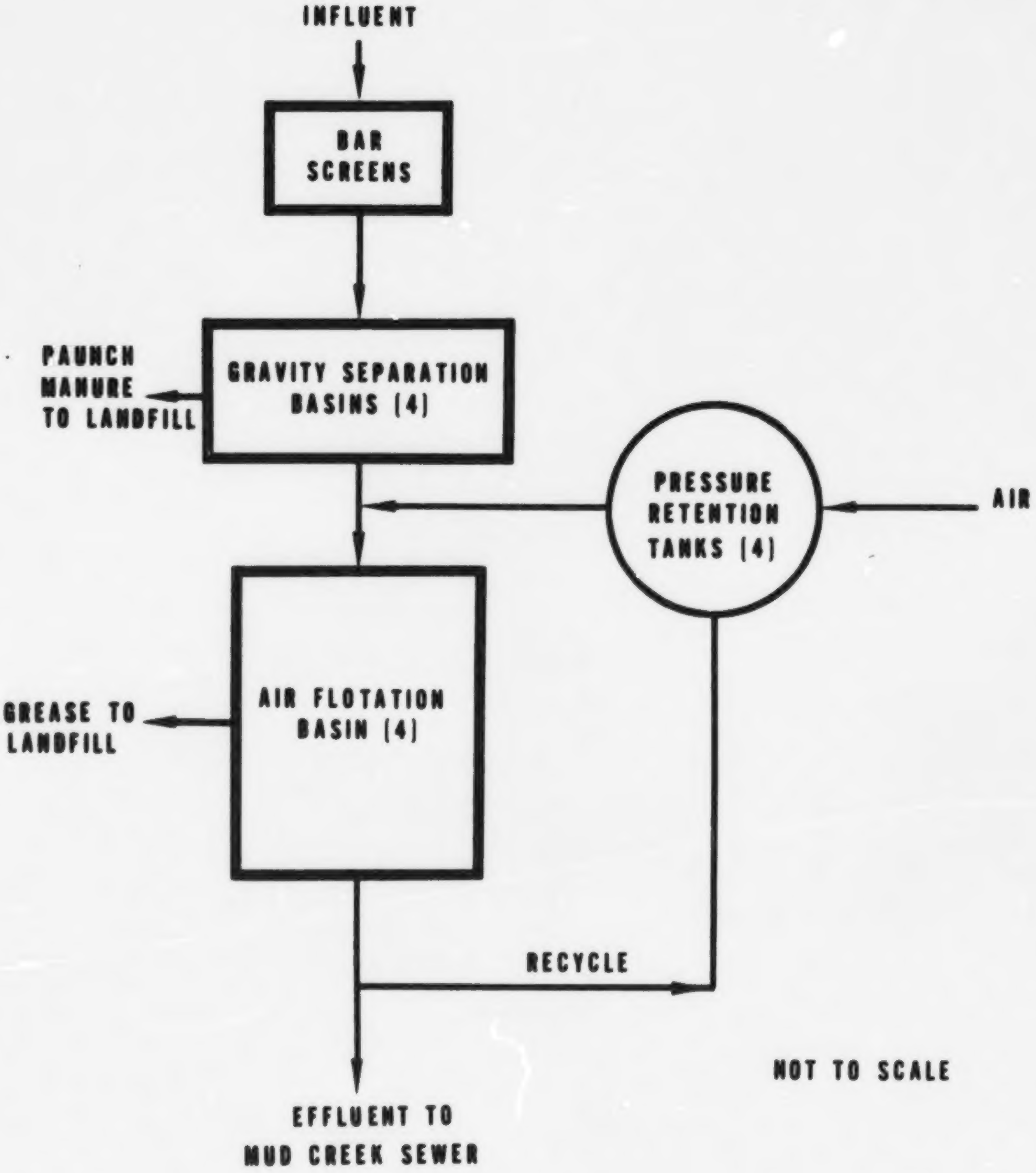

INFLUENT
BAR SCREENS
PAUNCH MANURE TO LANDFILL
GRAVITY SEPARATION BASINS (4)
PRESSURE RETENTION TANKS (4)
AIR
GREASE TO LANDFILL
AIR FLOTATION BASIN (4)
RECYCLE
NOT TO SCALE
EFFLUENT TO MUD CREEK SEWER

Figure 1. Central Wastewater Pretreatment Facility, Omaha, Nebraska

C. DISCUSSION OF IN-PLANT SURVEY AND FINDINGS

The Central Wastewater Pretreatment Facility was evaluated 30 July through 5 August 1970. Seven 24-hr composites were collected of the influent and effluent. Samples were manually composited on a flow-weighted basis with measurements taken from the flow recorder. Grab samples for oil-and-grease analysis were collected once daily from the influent and the effluent. Temperature, pH, and conductivity measurements were taken every hour [Table 2].

The survey revealed that the facility received weak wastes on Sunday (30 July 1972) because of limited activity in the packing houses. As the concentrations of suspended solids and oil and grease were 252 and 55 mg/l, respectively, the effluent concentrations met the Omaha City ordinance.

However, during the period 31 July through 5 August 1972 the suspended-solids concentration averaged 1,275 mg/l, more than three times the value stipulated by the City Ordinance. During the six-day period the maximum flows occurred from 0800 to 2100 hr and averaged 7.5 mgd. In the samples collected during this period (one grab sample daily) the oil-and-grease concentration ranged from 240-1,400 mg/l (average = 575 mg/l), thus yielding a grease load of 19,500 lb daily within this 13-hr period.* This load violated the requirements of the enforcement conference.

The six-day flow (3.54 to 8.21 mgd) constituted from 25 to 48 percent

---

* Although no oil-and-grease samples were collected during the night, grease was visible in the effluent at all times.

TABLE 2

SUMMARY OF FIELD MEASUREMENTS AND ANALYTICAL DATA
CENTRAL WASTEWATER PRETREATMENT FACILITY
30 JULY THROUGH 5 AUGUST 1972

Parameter[a]	Influent Range	Influent Average	Effluent Range	Effluent Average
Flow (mgd)			1.06-8.21	6.35
Temperature (°C)	25-40		26-38	
Conductivity (µmhos/cm)	1,400-5,600		1,700-3,800	
pH (S.U.)	6.0-9.5		5.5-7.8	
BOD	280-1,500	1,100	640-1,700	1,310
COD	332-16,000	7,120	760-4,480	2,920
TOC	78-1,040	800	210-1,030	740
Total Solids	2,250-9.960	4,830	2,010-3,050	2,770
Suspended Solids	104-5,050	2,780	252-2,040	1,130
VSS	80-4,770	2,520	240-1,850	988
Oil & Grease[b]	120-7,400	4,150[c]	55-1,400	500

---

[a] Unless otherwise noted, all units are in mg/l.

[b] This represents hexane-extractable material.

[c] This figure is based on four values.

of the flow received in the south inlet of the Missouri River WWTP. The amount of suspended solids discharged by the pretreatment facility ranged from 24 to 86 percent of the load received at the south inlet. These high suspended-solids loads, as well as grease loads, adversely effect the operation of the Missouri River WWTP. With an increasing grease load the skimmers on the clarifiers were unable to remove all the grease and the excess was discharged to the Missouri River.

The Federal Water Pollution Control Act Amendments of 1972 stipulate that the EPA Administrator publish regulations requiring that industrial wastewaters which are discharged to publicly owned treatment works be pretreated to meet specific standards. While such regulations have not been issued, it is expected that the standards will require reduction of pollutants to levels that will neither inhibit treatment of the combined wastes nor pass through the public system in concentrations inconsistant with required effluent limitations. The Central Wastewater Pretreatment Facility discharge does not now meet this requirement. Implementation of measures for upgrading the wastewater pretreatment facility [such as those discussed in Appendix H, Section D] will be necessary to meet the effluent limitations.

D. SUMMARY AND CONCLUSIONS

1. The Central Wastewater Pretreatment Facility was not meeting the requirements of the Missouri River Enforcement Conference, the City of Omaha Industrial Waste Ordinance (i.e., removal of suspended solids and oil and grease), and the pretreatment regulations to be promulgated under the 1972 Amendments.

2. The effluent from this facility accounted for 38 percent of the flow and 66 percent of the suspended solids discharged to the south inlet of the Missouri River Wastewater Treatment Plant. The solids loading results in operational problems in the Missouri River plant.

E. RECOMMENDATIONS

It is recommended that the treatment system be upgraded and the wastewater be pretreated to reduce pollutants to levels that will neither inhibit the treatment of combined wastes nor pass through the public system in concentrations or loads inconsistent with required effluent limitations.

FLINN PAVING COMPANY ASPHALT PLANT
66TH AND GROVER
OMAHA, NEBRASKA 68106

A. GENERAL

Flinn Paving Company asphalt plant produces asphaltic concrete (SIC 2951). Raw materials used to produce the paving material include "blow sand," agricultural lime rock (3/8-in. or less), rock (5/8-in. or less), road gravel, and asphalt cement. The plant employs 3 people and operates approximately 40 hr per week, during April through December, producing an average of 300 tons/day of paving material.

Water-pollution control practices were evaluated by EPA personnel of the National Field Investigations Center-Denver 7 through 9 August 1972. John Jantzon, plant superintendent, provided assistance and information.

The Refuse Act Permit Application stated that the average daily discharge (0.051 mgd) contained 6,120 mg/l of suspended solids and no trace of oil and grease.

B. WASTE SOURCES AND TREATMENT

Water obtained from a company well (20,000 to 50,000 gpd) is used in an air scrubber to remove dust particles produced during the mixing of the asphaltic concrete.

The wastewater from the air scrubber was discharged, without treatment, through a ditch into Little Papillion Creek. Asphalt cement, which has been spilled over a period of time in the storage tank area, entered the ditch and was discharged to the creek. Company officials stated they plan to install a settling pond and use chemical flocculant(s) in order to reduce the suspended solids in the effluent. However, they provided no definite time schedule as to when this is expected to be accomplished.

C. DISCUSSION OF IN-PLANT SURVEY AND FINDINGS

The waste-source survey at the Flinn Paving Company asphalt plant was conducted 7 through 9 August 1972. On 25 July 1972 M. L. Flinn, company president, had granted written permission to sample the wastewater. Three eight-hr composite samples (composited on equal-volume basis) were manually collected of the effluent and of the Little Papillion Creek upstream and downstream from the discharge. A grab sample of the effluent was collected once daily for oil-and-grease analysis [Table 1]. The temperature, pH, and conductivity were measured each time a sample was collected. EPA personnel determined the flow using a 60-degree V-notch weir and stage recorder.

Results of the in-plant survey revealed that the suspended solids discharged to Little Papillion Creek (RM 596.60/8.30/5.42/1.73)* ranged from 1,910 to 6,660 mg/l (430-1170 lb/day). This discharge resulted in an increase in the suspended-solids concentration from an average of 36 mg/l upstream of the discharge (RM 596.60/8.30/5.42/1.80) to 379 mg/l downstream (RM 596.60/8.30/5.42/1.70). There was visual discoloration and a sediment blanket in the creek downstream from the discharge. These

---

* This number refers to the location of the discharge to the receiving stream. For example, 596.60 is the mileage up the Missouri River to the mouth of Papillion Creek; 8.30, the mileage up Papillion Creek to Big Papillion Creek; 5.42, the mileage up Big Papillion Creek to Little Papillion Creek and 1.80 miles up Little Papillion Creek to the Flinn Paving Company discharge.

TABLE 1

SUMMARY OF FIELD MEASUREMENTS AND ANALYTICAL RESULTS
FLINN PAVING COMPANY ASPHALT PLANT
7 THROUGH 9 AUGUST 1972

Station Description	Date	Flow mgd	Temp range °C	Conductivity range µmhos/cm	pH range	Total Solids mg/l	Suspended Solids mg/l	Settleable Solids ml/l	Oil & Grease[a] mg/l
Flinn Paving Company effluent (RM 596.60/8.30/5.42/1.73)	8/7/72	0.033	32-45	280-2,000	10.4-10.9	5,460	3,740	31	19,000[b]
	8/8/72	0.027	47-49	300-850	10.1-10.6	2,600	1,910	18	166
	8/9/72	0.021	13->50	520-1,700	7.9-10.5	9,500	6,660	20	24
Little Papillion Creek, upstream of Flinn Paving Company effluent (RM 5.96.60/8.30/5.42/1.80)	8/7/72		14-23	580-675	7.8-9.0	426	40		
	8/8/72		18-22	560-575	7.6-8.6	301	38		
	8/9/72		13-20	400-700	7.3-8.8	350	30		
Little Papillion Creek, downstream from Flinn Paving Company effluent (RM 596.60/8.30/5.42/1.70)	8/7/72		14-22	560-600	7.8-8.8	708	234		
	8/8/72		18-22	560-570	7.6-8.5	626	376		
	8/9/72		14-20	425-625	7.4-8.4	1,010	528		

---

a/ This represents hexane-extractable material.
b/ There was a large piece of tar in sample.

conditions violate the General Water Quality Criteria of the Nebraska Water Quality Standards (e.g. "...waters shall be free of substances attributable to discharges ... having materials that will form objectionable deposits ... or turbidity...").

The pH of the effluent ranged from 7.9 to 10.9. The oil-and-grease concentration ranged from 24 to 19,000 mg/l as a result of the spilled asphaltic cement entering the discharge ditch. Chunks of asphaltic cement were visible in the effluent and account for the high concentrations of oil and grease.

The company has failed to provide adequate treatment, thus constituting a violation of the Nebraska Water Quality Standards.[*] The discharge is also subject to the Federal Water Pollution Control Act Amendments, which require that a permit be obtained and best practicable treatment be applied. Best practicable control technology currently available for this industry will produce an effluent containing not more than 20 mg/l of suspended solids, no detectable[**] oil and grease, and with a pH between 6.0 and 8.5.

D. SUMMARY AND CONCLUSIONS

1. Flinn Paving Company asphalt plant discharged untreated wastewater to Little Papillion Creek which contained from 430 to 1,170 lb/day

---

[*] The Nebraska Water Quality Standards require industries to provide equivalent secondary treatment. This has been defined as that degree of treatment attainable by installation of best practicable control technology currently available.

[**] The discharge of oil from this company can be eliminated by the construction of dikes around the asphaltic tanks and loading areas in order to contain all the spilled asphaltic cement.

of suspended solids and from 24 to 19,000 mg/l of oil and grease. This discharge increased the suspended-solids concentration and formed objectional bottom deposits in Little Papillion Creek, a violation of the Nebraska Water Quality Standards.

2. Failure of the company to provide adequate treatment also constitutes a violation of the Nebraska Water Quality Standards.

E. RECOMMENDATIONS

It is recommended that the effluent limitations to be prescribed for the Flinn Paving Company permit include the following:

1. The suspended solids discharged shall not exceed 20 mg/l or 5 lb/day whichever is less.

2. No oil and grease shall be discharged.

3. The pH shall be between 6.5 and 9.0.

Preceding page blank

NATIONAL BY-PRODUCTS, INC.
P. O. BOX 7187
OMAHA, NEBRASKA 68107

A. GENERAL

Prior to a fire that destroyed the National By-Products plant on 18 August 1972 the company was processing approximately 750 ton/week of fallen animals, offal, "shop scrap," and bone to produce 350 ton/week of fats and proteins that are used for animal and fowl feeds. Hides from fallen animals were cured and shipped to a tanner. The plant operated continuously, Monday through Friday, and 8 hr on Saturday. Approximately 60 people were employed.

A new plant is being constructed adjacent to the present facility. The new plant, which will have the same rated capacity as the present plant, was originally scheduled to be in operation by 1 July 1973. However, because of the fire the anticipated date of completion is now May 1973.

The Refuse Act Permit Application indicates that the daily waste discharge (0.25 mgd) contained 3,960 lb of BOD, 8,000 lb of COD, 1,220 lb of suspended solids, and 32 lb of oil and grease.

Water pollution control practices at this plant were evaluated by EPA personnel of the National Field Investigations Center-Denver 31 July through 3 August 1972. Francis Kellison, plant superintendent, provided assistance and information.

B. WASTE SOURCES AND TREATMENT

Water obtained from three company wells (90 ft deep) was used for cooling and plant cleanup. Upon completion of the new plant, water will be purchased from the City of Bellevue.

Wastewater was treated in two primary clarifiers operated in parallel. The units were located in the basement of the plant. The smaller clarifier (40 ft long, 5 ft wide, and 4.75 ft deep) received approximately 40 percent of the wastewater. The remainder was treated in a clarifier (68 ft long, 5 ft wide and 4.75 ft deep). Skimmings and solids were recycled, and the effluent was discharged through a drainage ditch (approximately 400 yd) to Papillion Creek (RM 596.60/2.0).

According to the plant superintendent, the company is considering pretreatment of the wastewater and then discharging it to the new Papillion Creek Wastewater Treatment Plant, to be completed in 1975. If this cannot be carried out, a treatment system consisting of a settling basin, two anaerobic lagoons (in series), followed by a polishing pond is to be constructed with the effluent discharged to Papillion Creek. A final decision had not been made at the time of this survey.

C. DISCUSSION OF IN-PLANT SURVEY AND FINDINGS

The waste-source survey at National By-Products, Inc., was conducted 31 July through 3 August 1972. On 25 July 1972 Francis Kellison, plant superintendent, granted written permission to sample the wastewater discharge. Two 24-hr composite samples (composited on equal-volume basis) of the effluent and Papillion Creek upstream and downstream from the discharge were manually collected. Grab samples for oil-and-grease analysis were collected periodically from these stations and from the Missouri River upstream and downstream from the mouth of Papillion Creek. Also collected were grab samples of the effluent for bacteriological analysis. Each time samples were taken, EPA personnel made temperature, pH, and conductivity measurements. Flow measurements were obtained by using a 60-degree V-notch weir and stage recorder. [Table 1 summarizes field measurements and analytical data. Bacteriological results are summarized in Table 2.] Chain-of-custody procedures were continuously maintained on the effluent samples [Appendix E].

Visual observations revealed that there was little, if any, operation and maintenance of clarifiers. The sides of the units were covered with grease. In addition, approximately two inches of grease and water were observed on the floor around the clarifiers.

The drainage ditch was covered with solidified grease and solids. (The depth of this scum was estimated to be in excess of 2 ft.) Floating solids and grease were observed daily entering Papillion Creek. Grease balls were observed in Papillion Creek downstream from the discharge and in the Missouri River downstream from the mouth of Papillion Creek. On the other hand, these grease balls were not observed either in Papillion Creek upstream of the discharge or in the Missouri River upstream of the creek.

Results of the in-plant survey disclosed that, during the survey, National By-Products, Inc. was discharging daily loads ranging from 2,800 to 5,200 lb (1,200-2,300 mg/l) of BOD: 5,300 to 51,000 lb (2,230-22,500 mg/l) of COD: and 27,700 to 36,300 lb (12,000-16,000 mg/l) of suspended solids. Based on the grab samples, the oil and grease discharged in the effluent ranged from 570 to 13,000 mg/l.

TABLE 1

SUMMARY OF FIELD MEASUREMENTS AND ANALYTICAL RESULTS
NATIONAL BY-PRODUCTS, INC.
31 JULY TO 3 AUGUST 1972

Station Description	Date	Flow cfs	Temp range °C	Conductivity range µmhos/cm	pH range	BOD mg/l	COD mg/l	TOC mg/l	Total Solids mg/l	Suspended Solids mg/l	VSS mg/l	D.O. mg/l	Oil & Grease[a/] mg/l
Effluent from plant	7/31/72	0.43	20-46	500-3,000	6.0-8.3	1,200	2,280	680	25,300	12,000	10,700		
	8/1/72	0.42	42-54	700-2,000	6.1-7.4	2,300	22,500	600	35,500	16,000	13,900		570
	8/2/72												13,000
Papillion Creek, upstream of National By-Products, Inc.	7/31/72	116	21-22[b/]	280-625[b/]	7.2-7.7							0.2	
	8/1/72	167	20-24	500-775	6.5-7.5	40			491	48	44		2
	8/2/72	136	18-23	600-800	6.6-7.8	25			481	76	24	0.4	6
Papillion Creek, downstream from National By-Products, Inc.	7/31/72		21-25	500-800	7.2-7.9	40	74	22	613	58	38	0.1	
	8/1/72		21-24	400-750	6.5-7.5	60	83	23	1,370	56	46		
	8/2/72		19-24	650-800	6.4-7.5	30	80	22	501	32	8	0.0	
	8/3/72												520
Missouri River, upstream[c/] of Papillion Creek	8/2/72												9
	8/3/72		24	700	8.2								6
Missouri River, downstream[c/] of Papillion Creek	8/2/72												3,100
	8/3/72		24	700	8.2								790

[a/] This is hexane-extractable material.
[b/] This figure is based on two values.
[c/] One grab sample was collected daily from this station.

TABLE 2

BACTERIOLOGICAL RESULTS
NATIONAL BY-PRODUCTS, INC. EFFLUENT
31 JULY TO 5 AUGUST 1972

Date	Time Collected	Total Coliforms	Fecal Coliforms	Fecal Streptococci
7/31/72	0755	1,000,000	170,000	130,000
7/31/72	0900	4,000,000	190,000	680,000
8/02/72	1610	2,600,000	470,000	2,900,000
8/03/72	1700	3,300,000	370,000	590,000
8/04/72	1925	28,000,000	3,500,000	9,200,000
8/05/72	1450	5,200,000	1,000,000	
Log Mean		4,000,000	520,000	1,100,000

Reproduced from best available copy.

The company does not provide disinfection of the effluent. Bacteriological data [Table 2] disclosed that the log mean of fecal coliform organisms discharged in the effluent was 520,000/100 ml.

The company has failed to provide adequate treatment of wastewaters, constituting a violation of the Nebraska Water Quality Standards.* The 1972 Amendments of the Federal Water Pollution Control Act require that a permit be obtained for this discharge, and that best practicable treatment technology be applied. Best practicable treatment technology will produce an effluent containing not more than 10 mg/l of BOD, 10 mg/l of suspended solids, 10 mg/l of oil and grease, and fecal coliform organisms of 1,000/100 ml.

Rhodamine WT dye (12.5 lb) was released into the effluent of National By-Products on 1 and 2 August 1972. The injected dye was traced downstream into the Missouri River through the use of a G. K. Turner Model 110 fluorometer. (Prior to its use, the fluorometer was zeroed against background water.) Samples were collected for oil-and-grease analysis of the effluent, from Papillion Creek upstream and downstream from the discharge, and from the Missouri River upstream and downstream from Papillion Creek, concurrently with the dye trace [Table 3].**

---

* The Nebraska Water Quality Standards require industries to provide equivalent secondary treatment. This has been defined as that degree of treatment attainable by installation of best practicable control technology currently available.

** The technique of this analysis is to hydrolyze the samples (of the effluent and receiving waters) prior to use of gas chromatography to characterize the compounds. The grease contained esters of stearic, palmitic, any myristic acids. The esters were not evident either in Papillion Creek upstream of the discharge or in the Missouri River upstream of Papillion Creek. Therefore, these techniques positively identified the grease as being from National By-Products, Inc.

TABLE 3

CHEMICAL CHARACTERIZATION OF WASTEWATER
NATIONAL BY-PRODUCTS, INC.
1 AND 2 AUGUST 1972

Station Description	Date	Hexane extractables mg/l
Papillion Creek, upstream of National By-Products	8/1/72	<1
	8/2/72	5
Effluent from National By-Products	8/1/72	2,270
	8/2/72	2,620
Papillion Creek, 100 feet downstream from National By-Products	8/1/72	13
	8/2/72	460
Missouri River, upstream of Papillion Creek	8/1/72	6
	8/2/72	<1
Missouri River, downstream from Papillion Creek	8/1/72	440
	8/2/72	2,970

The results indicated that the oil-and-grease concentrations in the Missouri River upstream were 9 mg/l or less, and increased to 790 mg/l or more downstream from the mouth of Papillion Creek.

The latter concentrations constitute a violation of the oil and grease water quality criteria established for the Missouri River ("...emulsified oil and grease shall be less than 15 mg/l" and "...waters shall be free from substances attributed to discharges ... having materials that will from objectionable ... floating debris, oil scum....").

D. SUMMARY AND CONCLUSIONS

1. National By-Products, Inc., discharged, into Papillion Creek, inadequately treated wastewater that contained daily loads of 2,300-5,200 lb of BOD: 5,300-51,000 lb of COD: 27,700-36,300 lb of suspended solids; plus oil and grease concentrations ranging from 570-13,000 mg/l. This discharge resulted in a violation of the Nebraska Water Quality Standards for oil and grease.

2. Failure of the company to provide adequate treatment by 1 January 1972 constitutes a violation of the Standards.

3. A dye trace of the company effluent showed that the wastewater, discharged into Papillion Creek, entered the Missouri River, an interstate stream. The oil-and-grease concentration in the Missouri River increased from 9 mg/l or less, upstream of Papillion Creek, to 790 mg/l or more (maximum of 2,970 mg/l), downstream of the creek. The increase in oil and grease was a direct result of the National By-Products, discharge.

4. A new treatment facility will be constructed that is to reduce

the present waste load discharged to Papillion Creek. The company is considering either pretreatment of the wastewater with the effluent discharged to New Papillion Creek WWTP to be completed in 1975 or secondary treatment of the wastewater with the effluent discharged into Papillion Creek.

E. RECOMMENDATIONS

It is recommended that:

1. The Company, provide pretreatment consistent with the requirements of the 1972 Amendments to the Federal Water Pollution Control Act and discharge all wastewaters to the new Papillion Creek Wastewater Treatment Plant.

2. If the effluent is discharged to Papillion Creek, the permit issued to National By-Products, Inc., based on best available control technology, include the following:

   a. The BOD discharged shall not exceed 10 mg/1 or 0.04 lb/1,000 lb raw material, whichever is less.

   b. The suspended solids discharged shall not exceed 10 mg/1 or 0.05 lb/1,000 lb raw material, whichever is less.

   c. The oil and grease discharged shall not exceed 10 mg/1 or 20 lb/day, whichever is less.

   d. The number of fecal coliform bacteria in the effluent shall not exceed 1,000/100 ml.

   e. The pH shall be between 6.5 and 9.0.

3. In the event the proposed Papillion Creek Wastewater Treatment Plant has not been completed at the time the industrial wastewater connection is made, the industry provide best practicable control technology.

Preceding page blank

THE QUAKER OATS COMPANY
302 PIERCE STREET
OMAHA, NEBRASKA 68103

A. GENERAL

The Quaker Oats Company manufactures furfural, furfuryl alcohol, and levulinic acid. Production figures are considered confidential by company officials. Raw materials include sulfuric acid, corncobs, oat hulls, and flax shives. Corn cobs are used in the process 90 percent of the time. The plant operates continuously and employes approximately 100 people.

Water-pollution control practices were evaluated by EPA personnel of the National Field Investigations Center-Denver from 3 through 5 August 1972. J. F. Nelson, plant manager, and R. N. Meyer, technical department manager, provided information and assistance.

B. WASTE SOURCES AND TREATMENT

Cooling water (7 mgd), used primarily for once-through flow, is purchased from the Omaha Public Power District. This water is discharged into the Missouri River (RM 615.23) without treatment.

Process and domestic water is purchased from the City of Omaha. Process wastewater is neutralized in a two-stage basin. The wastewater (pH of approximately 2) flows through the mixing basin (8.3 ft long by 7.5 ft wide by 8 ft deep) where impure calcium hydroxide is added and then into the reaction tank (16.7 ft square by 19 ft deep). The effluent is discharged into the Pierce Street sewer.

The company plans to construct additional wastewater treatment facilities consisting of a clarifier (28 ft in diameter with a 8-ft SWD). According to company officials, the clarifier that is scheduledd to be in operation approximately 1 January 1973 is designed to produce an effluent containing 100 mg/l-or-less of suspended solids. [Construction difficulties have caused this date to be postponed to 1 June 1973.]

C. DISCUSSION OF IN-PLANT SURVEY AND FINDINGS

A waste-source survey of The Quaker Oats Company was conducted 3 through 5 August 1972. On 21 July 1972 J. F. Nelson, plant manager, granted written permission to sample the wastewater discharges. Three 24-hour composites (composited on an equal-volume basis) were manually collected of the cooling water (influent and effluent) from an in-plant manhole* and from the Pierce Street sewer** (upstream and downstream from The Quaker Oats Company discharge). Each time a sample was collected EPA personnel made temperature, pH, and conductivity measurements [Table 1].

According to company data, 6.9 mgd of cooling water and 1.1 mgd of process water were discharged during the survey. An estimated flow of 0.9 mgd was discharged through the in-plant manhole. Analysis of this 0.9 mgd flow revealed that The Quaker Oats Company discharges average daily loads of at least 21,000 lb of BOD, 10,200 lb of TOC, 4,400 lb of suspended solids, and 900 lb of furfural. The resultant

---

* According to company officials, the flow at this station should be representative of the total discharge.

** Flow in the Pierce Street Sewer proceeds into the Pierce Street Lift Station and is subsequently pumped into the interceptor to the Missouri River Wastewater Treatment Plant.

TABLE 1

SUMMARY OF FIELD MEASUREMENTS AND ANALYTICAL RESULTS
THE QUAKER OATS COMPANY
3-5 AUGUST 1972

Station Description	Date	Flow mgd	Temp °C range	Conductivity µmhos/cm range	pH range	BOD mg/1	COD mg/1	TOC mg/1	Total Solids mg/1	Suspended Solids mg/1	VSS mg/1	Furfural mg/1
Pierce St. sewer, upstream of Quaker Oats Co.	8/3/72		24-27	425-700	7.2-8.5	450	526	170	1,070	134	108	<0.05[a/]
	8/4/72		24-30	425-700	7.1-8.2	270	330	96	720	296	256	<0.05[a/]
	8/5/72		25-27	375-700	7.2-8.1	260	226	63	540	276	236	<0.05[a/]
Quaker Oats Co. In-Plant Station	8/3/72		46-53	2,800-4,000	6.9-9.8	2,600			5,060	472	212	140
	8/4/72		50-58	2,900-5,500	7.0-10.0	2,800	4,150	1,410	5,920	688	424	115
	8/5/72		48-62	800-3,500	3.1-9.8	3,000	3,600	1,370	5,200	600	320	105
Pierce St. sewer, downstream from Quaker Oats Co.	8/3/72		45-56	2,000-6,000	6.9-10.2	2,700	3,230	980	5,890	628	304	75
	8/4/72		46-52	700-3,000	6.2	2,400	3,840	1,350	5,130	2,830	2,430	110
	8/5/72		46-56	1,300-4,000	4.0-11.0	2,700	3,390	1,100	4,720	2,200	1,930	110
Quaker Oats Co. cooling-water intake	8/3/72	6.9	20-24	475-750	6.2-8.4		56	11	612	110	32	<0.05[a/]
	8/4/72	6.9	22-24	500-725	7.0-8.4		63	7	580	76	52	<0.05[a/]
	8/5/72	6.9	22-24	400-700	7.5-8.6		78	8	534	78	42	<0.05[a/]
Quaker Oats Co. cooling-water effluent	8/3/72	6.9	42-55	600-850	7.5-8.4		29	6	659	114	8	<0.05[a/]
	8/4/72	6.9	44-56	600-750	6.8-8.1		83	5	660	62	50	[b/]
	8/5/72	6.9	43-54	500-700	7.3-8.5		23	5	549	70	22	<0.05[a/]

[a/] This is a minimum detectable.
[b/] Sample was broken in shipment.

large concentration of suspended solids in the Pierce Street sewer causes operational problems with the grit-removal facility at the Pierce Street Lift Station.

Moreover, this high concentration of suspended solids violates the Omaha Industrial Waste Ordinance that requires the suspended solids to be 400 mg/l or less in wastewaters discharged to the municipal sewer. The pH limit of 6.5 to 9.5 was also violated.

The wastewater discharged to the Pierce Street sewer must be pretreated to remove toxic substances and other pollutants to levels that will neither inhibit treatment of the combined wastes by biological treatment systems nor pass through the public systems in concentrations or loads inconsistent with effluent limitations and conditions prescribed by permits issued under NPDES.

At the times when the Pierce Street Lift Station is out of service the entire flow of the sewer and, thus, the high concentrations of furfural are by-passed into the Missouri River. Rhodamine WT dye was released, during the survey, into the Pierce Street sewer upstream of the company discharge. Visual observations showed that this dye entered the Missouri River (i.e., the lift station was by-passing flow to the river). Analysis of the wastewater in the Pierce Street sewer downstream from The Quaker Oats Company discharge yielded a furfural concentration of 75-110 mg/l. Furfural, highly soluble in water, has been shown, at concentrations of 6-25 mg/l,[1] to be toxic to certain species of fish. Although there were no stream data* collected during this survey to illustrate the effects of the by-passed furfural waste, degradation of water quality would occur in a localized section of the Missouri River.

---

* There was no collection of samples of river water downstream from The Quaker Oats Company discharge.

Analysis of the cooling water (6.9 mgd) indicated that only minor changes in concentrations of the measured parameters occurred, except for temperature, between the intake and discharge. The temperature increased from a maximum of 24°C (intake) to 56°C (effluent). No samples were collected in the river; however, the discharge of this heated effluent to the river (temperature of approximately 25°C) could cause a temperature increase in a localized area that would violate the Nebraska Water Quality Standards, i.e., "The temperature of the receiving water should not increase by a total of more than 5°F from natural May-October..."

The Federal Water Pollution Control Act Amendments of 1972 stipulate that the EPA Administrator publish regulations requiring that industrial wastewaters which are discharged to publicly owned treatment works be pretreated to meet specific standards. While such regulations have not been issued, it is expected that the standards will require removal of pollutants to levels that will neither inhibit treatment of the combined wastes nor pass through the public system in concentrations inconsistent with required effluent limitations. The Quaker Oats Company discharge does not now meet this requirement.

D. SUMMARY AND CONCLUSIONS

1. The Quaker Oats Company discharges once-through cooling water to the Missouri River without treatment. The temperature of the effluent

ranged from 42 to 56°C, or approximately twice the river temperature, and could cause localized areas which are in violation of Nebraska Water Quality Standards.

2. Process wastes, containing average daily loads of at least 21,000 lb of BOD, 10,000 TOC, 4,400 lb of suspended solids, and 900 lb of furfural, and with a pH ranging from 3.1 to 10.0 were discharged into the Pierce Street sewer. This discharge constituted a violation of the requirement of the Omaha Industrial Waste Ordinance (i.e. suspended solids and pH), and the pretreatment requirements to be promulgated under the 1972 Amendments.

3. The high concentrations of suspended solids caused operational problems at the Pierce Street Lift Station. During the time the lift station is inoperative, the entire flow of the Pierce Street sewer is by-passed into the Missouri River. This condition was observed during the survey. To aid in correcting this problem The Quaker Oats Company plans to construct a new clarifier designed to produce an effluent, containing 100 mg/l or less of suspended solids, that meets the stipulations of the Industrial Waste Ordinance.

E. RECOMMENDATIONS

It is recommended that the Quaker Oats Company:

1. Provide pretreatment of wastewater discharged to the Pierce Street sewer to reduce toxic substances and other pollutants to levels that will not inhibit treatment of combined wastes or pass through the public system in concentrations or loads inconsistent with effluent limitations and conditions prescribed by permit issued under NPDES.

2. The permit issued for the cooling-water discharge limit the temperature such that the river temperature shall not increase by more than 5°F (May-October) or 10°F (November-April) or cause the maximum river water temperature to exceed 90°F.

F. REFERENCE

1/ H. Turnball, J. G. DeMann, R. F. Weston. *"Toxicity of Various Refinery Materials to Fresh Water Fish."* Symposium on Waste Disposal in the Petroleum Industry. Industrial Engineering Chemistry. 46:324. 1954.

Reproduced from best available copy.

UNION PACIFIC SHOPS
9TH AND CASS STREETS
OMAHA, NEBRASKA 68102

A. GENERAL

The Union Pacific Shops service, repair, and maintain railroad equipment, principally locomotive units (SIC 3742). The shops, constructed prior to 1900, are presently being remodeled. Upon completion (1974), the new function of these shops will be to overhaul components (i.e., engines, drive units, traction motors, etc.) received from other locations around the United States. The shops operate continuously and about 1,350 people are employed.

EPA personnel of the National Field Investigations Center-Denver evaluated, 10 through 12 August 1972, the water pollution control practices at the Shops. L. R. Burdge, design engineer; P. L. Stageman, environmental engineer; F. Wees, pollution control engineer; and E. C. Osborne, treatment plant operator, provided information and assistance.

B. WASTE SOURCES AND TREATMENT

Water, purchased from the City of Omaha, is used for boiler feed, steam cleaning, cleaning vats, once-through cooling of air compressors, and sanitary purposes.

All industrial wastes from the shop area, as well as storm runoff, are collected and pumped to the treatment plant. An operator is on duty 8 hr/day, 5 days/week. The plant, designed for 120 gpm [Figure 1], consists of the following:

1. Two settling basins - each, 55.5 ft by 23 ft by 7 ft,

equipped with oil skimmers. (Reclaimed oil is sent by rail to Wyoming and used for soil stabilization along the railroad right-of-way. Settled solids are land-filled at the Gilmore Siding (located about 7 miles south of Omaha).)

2. Surge tank - 1,250 gal.; air is injected into the wastewater upstream of the surge tank to aid in separation of oil in the air-flotation tank.
3. Air flotation tank - 22.5 ft (diameter) by 13.3 ft (deep); 18 gph of coagulants (aluminum sulfate and sodium silicate) are added to the wastewater. (Settled solids are returned to the settling tanks for removal. Oil particles that adhere to air bubbles rising to the surface are skimmed from the tank and disposed of by spreading on the land at the Gilmore Siding.)
4. The pH of the wastewater is monitored and maintained between 6.0 and 9.0.

The effluent is discharged into the Missouri River (RM 616.15) through the Chicago Street sewer.

C. DISCUSSION OF IN-PLANT SURVEY AND FINDINGS

The waste-source survey at the Union Pacific Shops wastewater treatment plant was conducted 10 through 12 August 1972. On 26 July 1972 R. M. Brown, chief engineer, granted written permission to sample the wastewater effluent. Three 24-hr composites (composited on an equal volume basis) were manually collected of the effluent. Grab samples for oil-and-grease analysis were collected once daily for the effluent

C-47a

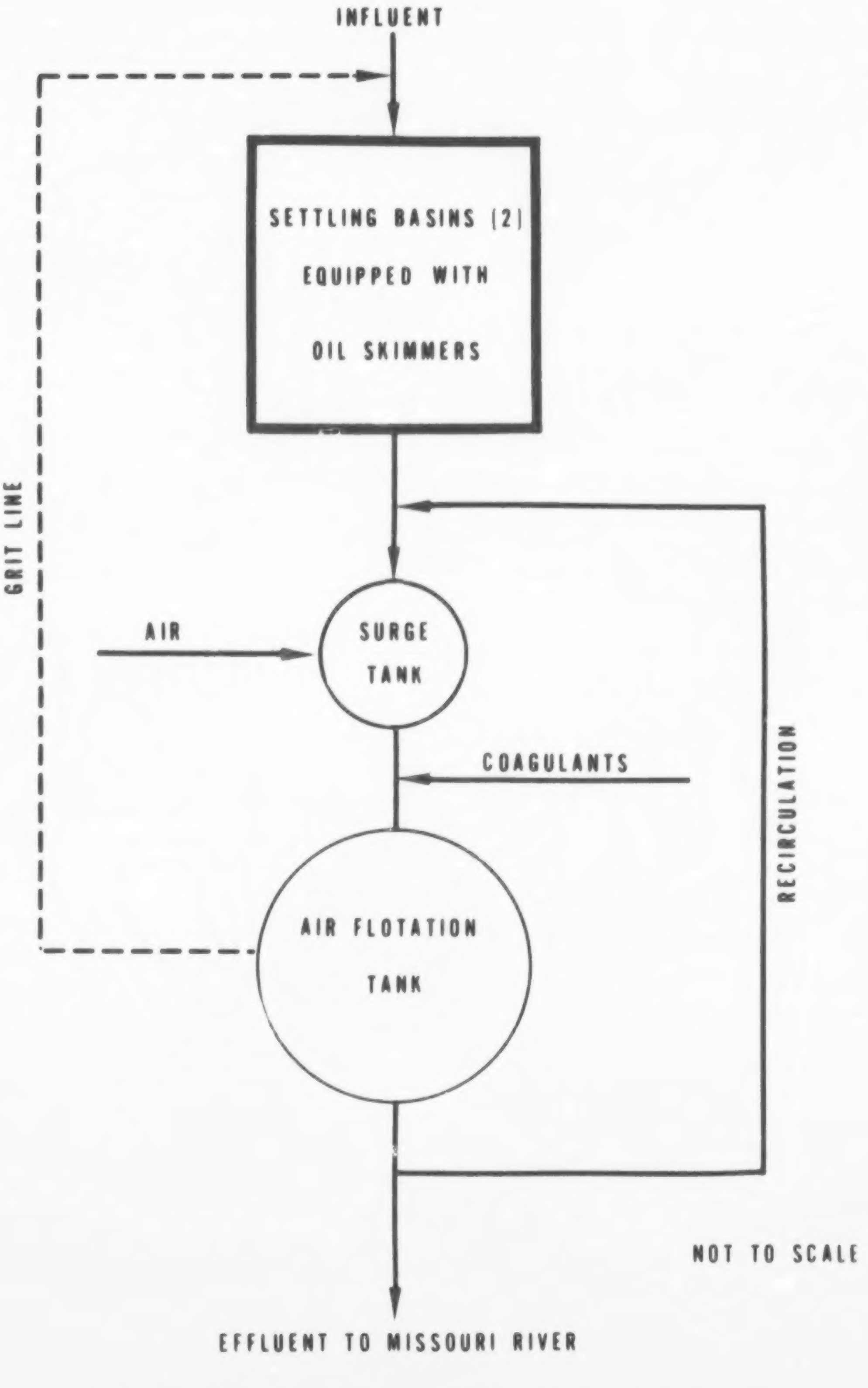

INFLUENT
SETTLING BASINS (2) EQUIPPED WITH OIL SKIMMERS
GRIT LINE
AIR
SURGE TANK
COAGULANTS
RECIRCULATION
AIR FLOTATION TANK
NOT TO SCALE
EFFLUENT TO MISSOURI RIVER

Figure 1. Wastewater Treatment Plant, Union Pacific Shops

and from the Missouri River upstream and downstream from the discharge. Each time EPA personnel collected a sample, temperature, pH, and conductivity measurements were also made. Company officials provided flow estimates [Table 1]. Chain-of-custody procedures were continuously maintained on all samples collected [Appendix E].

During the time of the survey the Union Pacific Shops discharged an effluent that contained some oil and grease (3 to 8 mg/l) and minor concentrations of heavy metals. The wastewater treatment provided is meeting that expected of best practicable control technology currently available for this type of waste. The effluent contains less than 10 mg/l of oil and grease and less than 30 mg/l of suspended solids.

Oil-and-grease samples were collected from the surface of the Missouri River upstream and downstream from the discharge. The data [Table 1] indicate that this discharge caused no detectable change in the oil-and-grease concentration in the Missouri River.

As previously indicated, the wastewater treatment was operated 8 hr/day, 5 days/week. During the 64 hr from Friday evening to Monday morning the treatment plant is on automatic operation. Therefore, an operational problem could develop during that period, resulting in the discharge of large amounts of oil and grease to the Missouri River.

D. SUMMARY AND CONCLUSIONS

1. Union Pacific Shops, Omaha, Nebraska, provides adequate treatment of wastewater and at present, meets the requirements specified for best practicable control technology currently available for oily wastewaters.

TABLE 1

SUMMARY OF FIELD MEASUREMENTS AND ANALYTICAL DATA
UNION PACIFIC SHOPS
10-12 AUGUST 1972

Station Description	Date	Flow[a] mgd	Temp °C range	Conductivity µmhos/cm range	pH range	COD mg/1	TOC mg/1	Total Solids mg/1	Suspended Solids mg/1	VSS mg/1	Oil & Grease[b] mg/1	Zn mg/1	Cu mg/1	Cd mg/1
Effluent from treatment plant	8/10/72	0.64	28-33	725-1,100	6.5-8.5	68	24	745	25	17	8	0.347	0.087	0.017
	8/11/72	0.64	31-33	450-1,300	6.5-6.8	88	18	782	48	26	3	0.166	0.039	0.008
	8/12/72	0.64	31-34	700-2,000	6.6-6.9	37	13	954	17	4	6	0.164	0.045	0.033
Missouri River,[c] upstream of Union Pacific Shops discharge	8/10/72		24	700	8.5						3			
	8/11/72		24	675	8.6						2			
	8/12/72		24	725	8.2						5			
Missouri River,[c] downstream from Union Pacific Shops discharge	8/10/72		24	650	8.5						11			
	8/11/72		25	700	8.6						2			
	8/12/72		24	700	8.3						4			

Note: Analysis for mercury, lead, and chromium indicated that the concentrations of these heavy metals were below the minimum detectable limits of 0.2 µg/1, 0.05 mg/1, and 0.1 mg/1, respectively.

---

[a] These values have been estimated by company officials.

[b] This is a hexane-extractable material.

[c] One grab sample was taken daily from this station.

Reproduced from best available copy.

2. The wastewater treatment plant is operated automatically over weekends (64 hr). Operational problems could develop, resulting in a large amount of oil and grease being discharged to the Missouri River.

E. RECOMMENDATIONS

It is recommended that:

1. The wastewater treatment plant have an operator on duty a minimum of 8 hr/day, 7 days/week, in order to reduce the possibility of equipment malfunction that could result in the discharge of a large amount of oil and grease to the Missouri River.

2. The Permit issued to the Union Pacific Shops contain the following limitations:

   a) The oil and grease discharged shall not exceed 10 mg/l or 50 lb/day, whichever is less;

   b) The suspended solids discharged shall not exceed 30 mg/l or 150 lb/day, whichever is less; and

   c) The pH shall be between 6.5 and 9.0.

D-1

APPENDIX D

STUDY METHODS

STUDY METHODS

WASTE SOURCE EVALUATIONS

Two municipal and six industrial waste sources were investigated. Information was obtained, through in-plant surveys, review of Refuse Act permit applications, and plant officials, on water pollution control practices at each plant.

Influent waste water samples of the Missouri River Wastewater Treatment and the Papillion Creek Wastewater Treatment Plant were collected upstream of the point of supernatant return. Samples from the Missouri River WWTP, the Papillion Creek WWTP, and the Central Wastewater Pretreatment Facility were collected manually, and flow composited according to instantaneous flow readings obtained near the point of collection. Samples from Allied Chemical Corporation, Flinn Paving Company asphalt plant, National By-Products, Inc., Quaker Oats Company, and Union Pacific Shops were collected manually and time composited (i.e. equal portions in each grab sample).

Samples for chemical analyses were collected in clean, unused containers; those for bacteriological analyses were collected in sterile glass containers. The dissolved-oxygen samples were collected in 300-ml bottles by use of a Sargent sampler.

Each time a sample was collected field measurements of pH, temperature, and conductivity were made. Samples were delivered to the NFIC-D mobile laboratory (Omaha, Nebraska) and analyzed for selected parameters (e.g., BOD, DO, settleable solids, suspended solids, volatile suspended solids, and oil and grease). Appropriate, preserved aliquots were shipped to the NFIC-D Laboratory (Denver, Colorado) and analyzed for TOC, COD, heavy metals, nutrients, phenolic materials, and furfural.

Grab samples of selected municipal and industrial effluents were analyzed for total coliforms, fecal coliforms, and fecal streptococci at the NFIC-D mobile laboratory.

Bacteriological analyses for total and fecal coliforms and for streptococci were performed, according to the accepted methods,[*] using the membrane filter technique.

The BOD and DO tests were conducted according to the accepted standard procedures,[*] using the azide modification of the Winkler Method.

Concentrations of furfural were determined colorimetrically by the method of Ettinger, *et al*,[**] and by gas chromatography.

All other laboratory analyses and field measurements employed were conducted in accordance with accepted standard techniques.[***]

STREAM SURVEYS

Limited stream surveys were conducted from 31 July to 11 August 1972 in order to determine the effects of waste water discharges on the receiving waters. The collection times for DO, oil and grease, and bacteriological samples were varied to achieve a time spread. Samples for chemical analyses that were collected upstream and downstream from the Allied Chemical effluent were time composited.

---

[*] *Standard Method for the Examination of Water and Wastewater*, 13th Edition, American Public Health Association. New York, N.Y. 1971.

[**] M. B. Ettinger, B. J. Lishka, and W. A. Moore, *The Determination and Persistence of Furfural in River Waters*, Proc. Ind. Waste Conf., 8th Conf. 1953, pp. 206-14. (1954)

[***] *Methods for Chemical Analyses of Water and Wastes*, Environmental Protection Agency, National Environmental Research Center, Analytical Quality Control Laboratory. Cincinnati, Ohio. 1971.

Sampling and analytical procedures were similar to those described in the previous section. Stream flow measurements were made only on Papillion Creek upstream of National By-Products, Inc. Flow rates for the Missouri River were obtained from USGS data.

APPENDIX E

CHAIN OF CUSTODY PROCEDURES

CHAIN OF CUSTODY PROCEDURES

POLICY: Chain of Custody procedures will be followed on sufficient samples to prove a water quality standard violation and a Refuse Act violation should court action ensue.

General:

The evidence gathering portion of a survey should be characterized by the absolute minimum number of samples required to give a fair representation of the effluent or water body from which taken.

The quantity of samples and sample locations will be determined prior to the survey and based on the requirements to establish a Refuse Act (civil or criminal) and Water Quality Standards violation.

Chain of Custody record tags will be prepared prior to the actual survey field work and will contain as much information as possible to minimize clerical work by field personnel. The source of each sample should also be written on the container itself prior to any field survey work.

Field log sheets will also be pre-filled to the extent possible to minimize repetitive clerical field entries.

Chain of custody procedures must be followed to maintain the documentation necessary to trace sample possession from the time taken until the evidence is introduced into court. A sample is in your "custody" if:

1. It is in your actual physical possession, or
2. It is in your view, after being in your physical possession, or
3. It was in your physical possession and then you locked it up in a manner so that no one could tamper with it.

All survey participants will receive a copy of the study plan and will be knowledgeable of its contents prior to the survey. A pre-survey briefing will be held to reappraise all participants of the survey objectives, sample locations and Chain of Custody procedures. After all Chain of Custody samples are collected, a de-briefing will be held in the field to determine adherence to Chain of Custody procedures and whether additional evidence type samples are required.

Sample Collection:

1. To the maximum extent achievable, as few people as possible should handle the sample.

Chain of Custody Procedures (Cont'd)

Sample Collection (Contd)

2. Stream and effluent samples should be obtained, using standard field sampling techniques.

3. The Chain of Custody record tag, red in color, (Exhibit I) should be attached to the sample container at the time the sample is collected and should contain the following information: sample number, time taken, date taken, source of sample (to include type of sample and name of firm), the preservative, analyses required, name of person taking sample and witnesses. The front side of the card (which has been prefilled) should be signed, timed and dated by the person sampling. The sample container should then be sealed with a preprinted, gummed seal containing our Agency designation, date and sampler's signature (Exhibit II). The seal should cover the string or wire tie of the Chain of Custody tag so it cannot be removed. It should also prevent the opening of the container without breaking the seal. The tags and seals must be legibly filled out in ballpoint (waterproof ink).

4. Blank samples should also be taken. Include one sample container without preservative and containers with preservatives which will be analyzed by the laboratory to exclude the possibility of container contamination.

5. A bound field notebook, or log, should also be maintained to record field measurements and other pertinent information necessary to refresh the sampler's memory in the event he later takes the stand to testify regarding his action's during the evidence gathering activity. A separate set of field notebooks should be maintained for each survey and stored in a safe place where they could be protected and accounted for at all times. A standard format (Exhibit III) should be established to minimize field entries and should include the date, time, survey, type of samples taken, volume of each sample, type of analysis, sample numbers, preservatives, sample location, field measurements such as temperature, conductivity, DO, pH, and any other pertinent information or observations. The entries should then be signed by the field sampler. The preparation and conservation of the field notebooks during the survey will be the responsibility of the survey coordinator. Once the survey is complete, field logs will be retained by the survey coordinator, or his designated representative, as a part of the permanent record.

6. The field sampler is responsible for the care and custody of the samples collected until properly dispatched to the receiving laboratory or turned over to an assigned custodian. He must assure that each container is in his physical possession or in his view at all times, or locked in such a place and manner that no one can tamper with it.

Chain of Custody Procedures (Cont'd)

Sample Collection (Cont'd)

7. Colored slides or photographs should be taken which would visually show the outfall sample location and any water pollution to substantiate any conclusions of the investigation. Written documentation on the back of the photo should include the signature of the photographer, time, date and site location. Photographs of this nature, which may be used as evidence, should also be handled recognizing Chain of Custody procedures to prevent alteration.

Transfer of Custody and Shipment:

1. When turning over the possession of samples, the transferee will sign, date and time the reverse side of the Chain of Custody record tag. Custody transfers, if made to a sample custodian in the field, will be made for individual samples. The back side of the card (Exhibit I) "Receipt of Sample", must be filled in by the second person who takes custody. If a third person takes custody, he must fill in the second "Receipt of Sample" portion. An additional custody card must be filled in by persons who thereafter take "custody"; therefore, the number of custodians in the chain should be as few as possible. Additional cards should be numbered consecutively.

2. The field custodian or field sampler, if a custodian has not been assigned, will have the responsibility of properly packaging and dispatching samples to the proper laboratory for analysis. The "Dispatch of Sample" portion of the Chain of Custody record tag will be properly filled out, dated, and signed.

3. Samples will be properly packed to avoid breakage. Preprinted gummed seals will be utilized to seal the package so that tampering can be detected (Exhibit II).

4. All packages will be accompanied by a Sample Transmittal Sheet showing identification of the contents (Exhibit IV). The original and one copy will accompany the shipment, a copy mailed directly to the laboratory, a copy mailed to Data Management and a copy retained by the survey coordinator.

5. If sent by mail, register the package with return receipt requested. If sent by common carrier, a Government Bill of Lading should be obtained. Receipts from post offices and bills of lading will be sent to and retained by the laboratory custodians as part of the permanent Chain of Custody documentation.

6. If samples are delivered to the laboratory when appropriate personnel are not there to receive them, the samples must be

Chain of Custody Procedures (Cont'd)

Transfer of Custody and Shipment (Cont'd)

locked in a designated area within the laboratory in a manner so that no one can tamper with them. The same person must then return to the laboratory and unlock the samples and deliver custody to the appropriate custodian.

Laboratory Custody Procedures:

1. The laboratory shall designate one full-time employee as a "sample custodian". An alternate will be designated in his absence. In addition, the laboratory shall set aside a "sample storage security area". This should be a clean, dry, isolated room which can be securely locked from the outside. The custodian shall also maintain a permanent log book in which he records, for each sample, the person delivering the sample, the person receiving the sample, date and time received, source of sample, sample number, how transmitted to lab, and a number assigned to each sample by the laboratory. A standardized format should be established for log book entries.

2. All samples should be handled by the minimum possible number of persons.

3. All incoming samples shall be received only by the custodian, who will indicate receipt by signing the Sample Transmittal Sheets accompanying the samples and retaining the sheets as permanent records.

4. Immediately upon receipt, the custodian will affix a number to the attached tag, record the required information in the log book and place the sample in the sample room, which will be locked at all times except when samples are removed or replaced by the custodian. To the maximum extent possible, only the custodian should be permitted in the sample room.

5. The custodian shall ensure that heat-sensitive or light-sensitive samples, or other sample materials having unusual physical characteristics, or requiring special handling, are properly stored and maintained.

6. Only the custodian will distribute samples to personnel who are to perform tests. The custodian will enter into the log the laboratory sample number, time and date, and the signature of the person to whom given.

7. Laboratory personnel should examine the seal on the container prior to opening and should be prepared to testify that their examination of the container indicated that it had not been opened or otherwise tampered with.

Chain of Custody Procedures (Cont'd)

Laboratory Custody Procedures (Cont'd)

8. The analyst will record in his log book the name of the person from whom the sample was received, whether it was sealed, identifying information describing the sample (by origin and sample identification number), the procedures performed and the results of the testing. The notes should be signed and dated by the person performing the tests and retained as a permanent record in the laboratory. In the event that the person who performed the tests is not available as a witness at time of trial, the government may be able to introduce the notes in evidence under the Federal Business Records Act.

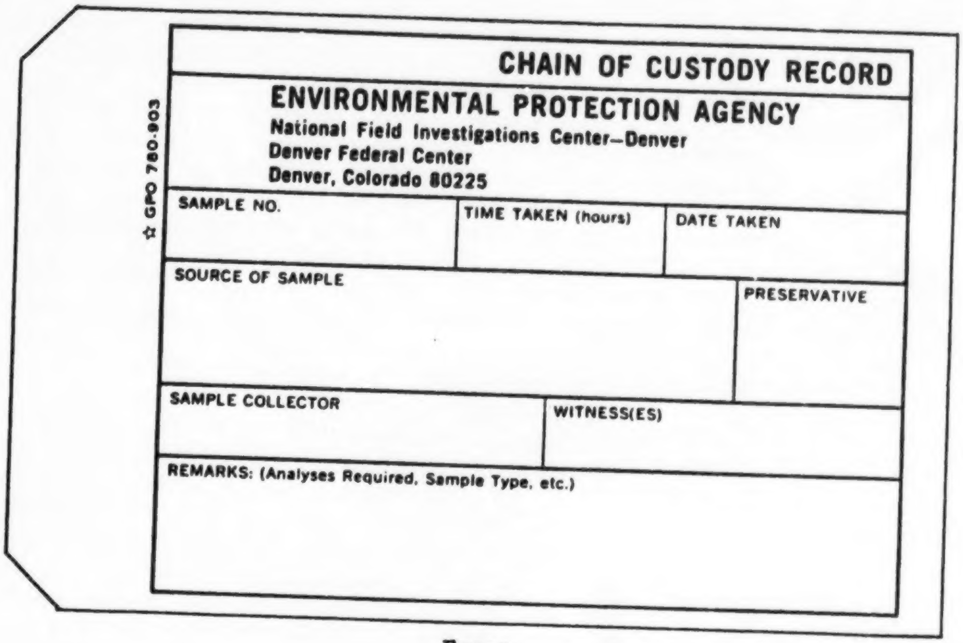
9. To the extent possible, standard methods of laboratory analyses shall be used. If laboratory personnel deviate from standard procedures, they should be prepared to justify their decision during cross-examination.

10. Laboratory personnel are responsible for the care and custody of the sample once it is handed over to them and should be prepared to testify that the sample was in their possession and view or securely locked up at all times from the moment it was received from the custodian until the tests were run.

11. Once the sample testing is completed, the unused portion of the sample, together with all identifying tags and seals, should be returned to the custodian who will make the appropriate entries in his log. The returned tagged sample will be retained in the sample room until it is required for trial. Strip charts and other documentation of work will also be turned over to the custodian.

12. Samples, tags and laboratory records of tests may be destroyed only upon the order of the laboratory director, who will first confer with the DFI Director to make certain that the information is no longer required or the samples have deteriorated.

EXHIBIT 1



CHAIN OF CUSTODY RECORD

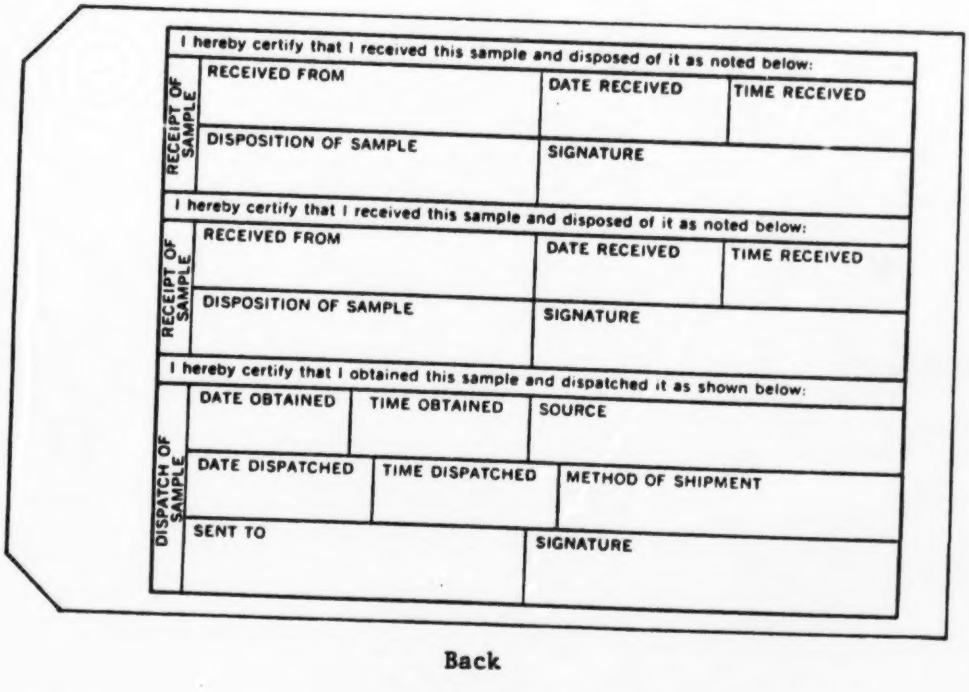
ENVIRONMENTAL PROTECTION AGENCY

National Field Investigations Center—Denver
Denver Federal Center
Denver, Colorado 80225

☆ GPO 780-903

SAMPLE NO.	TIME TAKEN (hours)	DATE TAKEN
SOURCE OF SAMPLE		PRESERVATIVE
SAMPLE COLLECTOR	WITNESS(ES)	
REMARKS: (Analyses Required, Sample Type, etc.)		

Front



I hereby certify that I received this sample and disposed of it as noted below:

RECEIPT OF SAMPLE	RECEIVED FROM	DATE RECEIVED	TIME RECEIVED
	DISPOSITION OF SAMPLE	SIGNATURE	

I hereby certify that I received this sample and disposed of it as noted below:

RECEIPT OF SAMPLE	RECEIVED FROM	DATE RECEIVED	TIME RECEIVED
	DISPOSITION OF SAMPLE	SIGNATURE	

I hereby certify that I obtained this sample and dispatched it as shown below:

DISPATCH OF SAMPLE	DATE OBTAINED	TIME OBTAINED	SOURCE
	DATE DISPATCHED	TIME DISPATCHED	METHOD OF SHIPMENT
	SENT TO	SIGNATURE	

Back

EXHIBIT 11

ENVIRONMENTAL PROTECTION AGENCY	SAMPLE NO.	SEAL BROKEN BY	DATE
	SIGNATURE		
	PRINT NAME AND TITLE (*Inspector, Analyst or Technician*)		

EPA Form
7500-2 (10-71)

SAMPLER ______________________

____

EXHIBIT III
FIELD DATA RECORD

DATE ____________

STATION	NUMBER	DATE	TIME	TEMPERATURE °C	CONDUCTIVITY µmhos/cm	pH S.U.	D.O. mg/l	Gage Ht. or Flow Ft. or CFS

EXHIBIT III

FOR ______________________________ ______________________________ SURVEY, PHASE ____, DATE ______________

TYPE OF SAMPLE ______________________________

					ANALYSES REQUIRED																					
STATION NUMBER	STATION DESCRIPTION	TOTAL VOLUME	TYPE CONTAINER	PRESERVATIVE	NUTRIENTS	BOD	COD	TOC	TOTAL SOLIDS	SUSPENDED SOLIDS	ALKALINITY	DO	pH*	CONDUCTIVITY*	TEMPERATURE*	TOTAL COLIFORM	FECAL COLIFORM	TURBIDITY	OIL & GREASE	METALS	BACTI	PESTICIDES	HERB	TRACE ORGANICS	PHENOL	CYANIDE
	REMARKS																									
	Field Measurements																									

Sampler(s) ______________________

____

EXHIBIT IV

ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF ENFORCEMENT
DIVISION OF FIELD INVESTIGATIONS—DENVER CENTER
BUILDING 53 , ROOM B1405A DENVER FEDERAL CENTER
DENVER, COLORADO 80225

SAMPLE TRANSMITTAL SHEET

TO: (Laboratory Name & Address)

FROM: (Field custodian or Field Sampler)

Sample No.	Lab Number	Preservative	Analysis Required

To be completed in field:

Prepared by: ____________________ Date: ______________
Signature

Field Notebook No. ______________ Time: ______________

To be completed by Laboratory:

Received by: ____________________ Date: ______________

Time: ______________

Distribution: Orig. & 1 copy - Accompany shipment
1 copy - mail directly to Laboratory
1 copy - mail to Data Management
1 copy - Survey Coordinator Field Files

APPENDIX F

EFFLUENT LIMITATIONS
AND
PRETREATMENT REQUIREMENTS

Effluent Limitations
and
Pretreatment Requirements

The recommended effluent limitations based on the best practicable control technology currently available and/or pretreatment requirements for those industries evaluated are summarized herein. The permits issued to the industries should contain the requirements listed as follows.

Allied Chemical Corporation, Agriculture Division, P.O. Box 7354, Omaha, Nebraska 68107

1. The suspended solids discharged shall not exceed 20 mg/1 or 160 lb/day, whichever is less.
2. The total Kjeldahl nitrogen (ammonia + organic nitrogen) discharged shall not exceed 20 mg/1 or 140 lb/day, whichever is less.
3. The nitrite-nitrate nitrogen shall not exceed 10 mg/1 or 45 lb/day, whichever is less.
4. The oil and grease discharged shall not exceed 10 mg/1 or 65 lb/day, whichever is less.
5. The pH shall be between 6.5 and 9.0.
6. No toxic or hazardous material, as designated under the provisions of Section 307 of the Federal Water Pollution Control Act as ammended, or known to be hazardous or toxic by the permittee, shall be discharged except with the approval of the Administrator (EPA) or his designee.

Central Wastewater Pretreatment Facility, Omaha, Nebraska

This facility shall pretreat the wastewater discharged into the city sewers in order to meet the requirements of the Federal Water Pollution Control Act Amendments of 1972. These amendments require that industrial wastes, discharged to publicly owned treatment works, be pretreated to reduce pollutants to levels that will neither inhibit treatment of the combined wastes nor pass through the public system in concentrations inconsistent with required effluent limitations.

Flinn Paving Company Asphalt Plant, 60th and Crover, Omaha, Nebraska 68106

1. The suspended solids discharged shall not exceed 20 mg/l or 5 lb/day, whichever is less.

2. The effluent shall contain no oil and grease.

3. The pH shall be between 6.5 and 9.0.

National By-Products, Inc., Box 7187, Omaha, Nebraska 68107

1. The BOD discharged shall not exceed 10 mg/l or 0.04 lb/1,000 lb of raw material, whichever is less.

2. The suspended solids discharged shall not exceed 10 mg/l or 0.05 lb/1,000 lb of raw material, whichever is less.

3. The oil and grease discharged shall not exceed 10 mg/l or 20 lb/day, whichever is less.

4. In the effluent the number of fecal coliform bacteria shall not exceed 1,000/100 ml.

5. The pH shall be between 6.5 and 9.0.

Reproduced from best available copy.

The Quaker Oats Company, 302 Pierce Street, Omaha, Nebraska 68103

1. The temperature of the cooling water discharged shall not increase the river water temperature by more than 5°F (May-October) or 10° F (November-April), and the maximum river water temperature shall not exceed 90°F.

2. Industrial process wastewaters, discharged to publicly owned treatment works shall be pretreated to reduce the pollutants to levels that will neither inhibit treatment of the combined wastes nor pass through the public system in concentrations inconsistent with required effluent limitations.

Union Pacific Shops, 9th and Cass Streets, Omaha, Nebraska 68102

1. The suspended solids discharged shall not exceed 30 mg/l or 150 lb/day, whichever is less.

2. The oil and grease discharged shall not exceed 10 mg/l or 50 lb/day, whichever is less.

3. The pH shall be between 6.5 and 9.0.

G-1

APPENDIX G

COMMERCIAL AND INDUSTRIAL USE
OF
PUBLIC SEWERS AND DRAINS
OMAHA INDUSTRIAL WASTE ORDINANCE
RULES AND REGULATIONS, MAY 1965

C-1a

OMAHA INDUSTRIAL WASTE ORDINANCE

Ordinance 23364 Adopted May 1965

Ordinance 23732 Amended March 1966

"AN ORDINANCE to amend Title 51 of the Omaha Municipal Code, entitled "Sewers" by adding thereto a new Chapter numbered 51.18, entitled "Commercial and Industrial Use of Public Sewers and Drains"; to establish regulations for commercial and industrial use of public sewers and drains, and the discharge of water and wastes therefrom into the sewer system and into natural outlets; to provide for definitions; to provide for adoption of Rules and Regulations governing the discharge of sewage and industrial wastes and other matter into the City of Omaha sewerage system; to establish rates of surcharge and defining terms; to regulate the discharge of certain commercial and industrial wastes into the sewerage system of the City of Omaha; to regulate discharge thereof into natural water courses under permit; to require that such wastes to be discharged into the city sewer system be authorized by permit from the Chief Plumbing Inspector of the Permits and Inspections Division of the Public Safety Department on the approval of City Sanitary Engineer; to provide a program of inspection and regulation of all discharges of commercial and industrial wastes in the city and its environs, to protect the City's Sewage Treatment Plants; to preclude said wastes from entering such sewer system, unless excessive concentrations are reduced by improved housekeeping and in plant controls to relieve the City's sewage treatment works and plants of the undur burdon thereof; to avoid wrongful or prohibited or improper pollutional effects on the receiving streams; to prohibit the discharge into the city sewer system or into any natural watercourse of the city of certain soluble, insoluble, inflammable, toxic, corrosive, or irritating substances or noxious or deleterious wastes and to authorize the City Sanitary Engineer to make reasonable regulations to govern all discharges, commercial and industrial wastes and the storage of dangerous materials; to require reports from all persons, storing or discharging same, and inspect all such wastes or materials stored or discharged into the city sewer system, or into natural water courses in the city; to determine compliance with the provisions of this ordinance and the regulations authorized hereby; to provide penalties; to provide for appeal; to provide a severability clause; and to provide the effective date hereof.

BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF OMAHA:

Section 1. That Title 51 of the Omaha Municipal Code, entitled "Sewers", be, and hereby is, amended by adding thereto a new chapter numbered 51.18, reading as follows:

" Chapter 51.18

COMMERCIAL AND INDUSTRIAL USE
OF
PUBLIC SEWERS AND DRAINS

"51.18.010 Definitions. Unless the context specifically indicates otherwise, the meaning of terms used in this ordinance shall be as follows:

'City' shall mean the City of Omaha, Nebraska.

'Sewage Works' shall mean all facilities for collecting, removal, discharge, conducting, carrying, transporting, pumping, treating, and disposing of sewage.

'Sewage' shall mean a combination of the water carried wastes from residence, business buildings, institutions, and industrial establishments, together with such ground, surface, and storm waters as may be present, containing animal and vegetable matter in suspension or solution and may include liquid from laboratories and industry containing minerals in solution.

'Sanitary Sewage' shall mean wastes which are comparable to wastes which originate in residential units and contain only excrement and waste from kitchen, laundry, bathing, and other usual household facilities.

'Sewer' shall mean a pipe or conduit carrying sewage and other liquid wastes.

'Combined Sewers' shall mean a sewer receiving both surface runoff water and sewage.

'City Sewer' shall mean a sewer serving abutting property and subject to control and regulation by the city.

'Sanitary Sewer' shall mean a sewer which carries sewage and which does not carry storm, surface and ground waters.

'Storm Sewer' or 'Storm Drain' shall mean a pipe or conduit which carries storm and surface waters and drainage, but excludes sewage and industrial and commercial wastes; it may, however, carry cooling waters and unpolluted waters.

'Sewage Treatment Plant' shall mean any arrangement of devices and structures, (above or below ground), used for treating, disposal, carrying and conducting sewage.

'Commercial and Industrial Wastes' shall mean the water-carried wastes from commercial and industrial establishments (processes) as distinguished from household type sanitary sewage.

'Garbage' shall mean solid food wastes from the preparation, cooking, and disposing of food, and from the handling, storage, and sale of products.

'Properly Shredded Garbage' this shall mean the wastes from the preparation, cooking, and the dispensing of food has been shredded to such a degree that all particles may be carried and normally under the flow conditions normally prevailing in the city sewer and with no particle greater than 1/2 inch in any dimension.

'B.O.D.' (abbreviation for bio-chemical, oxygen demand), shall mean the quantity of oxygen utilized in the bio-chemical oxidation of organic matter under standard laboratory procedure in five (5) days at 20° centigrade, (68° fahrenheit) expressed in parts per million by weight.

'pH' shall mean logarithm of the reciprocal weight of hydrogen ions in grams per liter of solution.

'Suspended Solids' shall mean solids that either float on the surface or are in suspension in water, sewage, or other liquids, and which are removable by laboratory filtering.

'Natural Outlet' shall mean any outlet into watercourse, pond, ditch, lake, or other body of surface or ground water.

'Water Courses' shall mean a channel in which a flow of water occurs either continuously or intermittently.

'Person' shall mean an individual, firm, company, association, society, corporation, or group.

'Standard Laboratory Methods' shall mean methods of analysis and testing as outlined in the Twelfth edition of 'Standard Methods for the Examination of Water and Waste Water' 1960, published jointly by the American Public Health Association,. American Waterworks Association, and Water Pollution Control Federation. Three (3) copies of which are on file in the Office of the City Clerk of the City of Omaha, Nebraska, and the same are hereby adopted and incorporated as fully as if set out in length herein and from the date on which this Chapter shall take effect.

'Receiving Stream' shall mean any natural water course into which sewage in discharged.

'S-Meter' shall mean (1) a meter or meters used on a water supply other than a municipal water supply, that is, wells, private water company, etc., or (2) a meter or meters used to supplement the meter or meters measuring a municipal water supply and considered necessary in the determination of the sewage charge and surcharge.

'Slug' shall mean any water or wastes exceeding a concentration greater than five (5) times that of the 'normal sewage', and which is discharged continuously for a period longer than fifteen minutes or at a rate exceeding one thousand (1,000 g.p.m.) gallons per minute.

'Cooling Water' shall mean the water discharged from any system of condensation, air conditioning, cooling, refrigeration, or other, but which shall be free from an increase in odor and oil. It shall contain no polluting substances which would increase B.O.D., or suspended solids each in excess of 10 parts per million by weight.

'Unpolluted Water or Waste' shall mean any water or waste containing none of the following:

Free or emulsified grease or oil; acid or alkali; phenols or other substances imparting tastes and odor in receiving waters; toxic or poisonous substances in suspension, colloidal state or solution; and noxious or odorous gases. It shall contain not more than 8,000 parts per million by weight of dissolved solids, of which not more than 2,500 parts per million shall be as chloride with permissible volume subject to review by the City Sanitary Engineer; and shall not cause an increase of more than ten (10) parts per million each of suspended solids, and B.O.D. The color shall not exceed fifty (50 ppm) parts per million. Any water or wastes, meeting these standards, may be discharged to the waters of the state, under direct supervision of the city, and under permit from the Nebraska Water Pollution Control Council'. Determination of 'unpolluted waters or wastes' shall be made by the City of Omaha working in conjunction with the Nebraska Water Pollution Control Council of the Department of Health, State of Nebraska.

'Recoverable Grease' shall mean 70% of the total grease by n-hexane (B.P. 67°- 70° c) extraction.

'Foreign Accounts' shall mean the water accounts of a political subdivision, other than the Metropolitan Utilities District, which supplies water to and bills the account for the service.

'Waters of the State' shall mean all streams, lakes, ponds, marshes, watercourses, waterways, wells, springs, irrigation systems, drainage systems, and all other bodies, or accumulations of water surface or underground, natural or artificial, which are situated wholly or partly within the jurisdiction of the State of Nebraska which drain to, or affect a junction with other waters draining to the Missouri River from the territory within the Missouri River Watershed.

'Water Supply Meter' shall mean any meter used on any water supply line supplying water to a premise from any source whether municipal or private, that is, meters on service branches from the municipal water mains, meters on the service branches from private water company water mains, meters on lines from wells and any other meters that shall be determined by the City of Omaha's City Sanitary Engineer.

'Normal Sewage' shall mean sewage that, when discharged in the Papillion Creek Plant service area sewer system, contains not over 300 ppm of suspended solids (2,500) pounds per million gallon and contains not over 240 ppm of the B.O.D., by weight (2,000) pounds per million gallon, or; when discharged in the Missouri River Plant service area sewer system, contains not over 400 ppm of suspended solids (3,332) pounds per million gallons, and which does not contain any of the materials or substances as follows:

1). Any liquid or vapor having a temperature higher than 150° fahrenheit, except where the volume of discharge represents a significant portion of the flow to a particular sewer, a lower limit may be prescribed by resolution of the Omaha City Council to prevent odor nuisances.

2). Wastes having a pH less than 6.5 or greater than 9.75 or otherwise having chemical properties which are hazardous or capable of causing damage to the sewage works or personnel.

3). Insoluble oils, fats, and grease, so called n-hexane (B.P.67°-70°c) oils may be admitted to the extent of 100 ppm, recoverable (833 lbs. per million gallon) provided subsequent dilution in the sewers or treatment plant does not result in separation.

4). Any solvent, liquid or gas which by reason of its major quantity may cause fire or explosion.

5). Any solvent or viscose material which could cause an obstruction to the flow in the sewers, or in any way interfere with the treatment processes; in part being such items or material as: ashes, wax, paraffin, cinders, sand, mud, straw, shavings, metal, blood, grease, rags, lint, feathers, tar, plastics, wood, sawdusts, lubricants, hair, fleshings, and paunch manure, entrails, lime slurrys, beer and distillery slops, grain processing wastes, grinding combinations, accetylene generation, sludge, chemical residues, acid residues, and food processing bulk solids.

6). Wastes contining phenolic compounds over .50 ppm expressed as phenol.

7). Wastes containing cyanides or compounds capable of liberating hydrocyanic acid gas over 2 ppm expressed as hydrogen cyanide.

8). Wastes containing sulfides over 10 ppm expressed as hydrogen sulfide.

9). Wastes containing solutions of metals of such concentration as to have an adverse affect upon the sewage works, treatment process, or receiving stream.

10). Septic tanks sludge, from residential dwellings, except that such sludges may be discharged into selected treatment plants at locations designated by the City Sanitary Engineer, for this purpose.

11). Any corrosive, noxious or malodorous material or substance which, either singularly or by reaction with other wastes, causes or may cause damage to the sewage works or constitutes, or may constitute a public nuisance or hazard or is of such nature as to prevent entry into or about the sewers for maintenance and repair thereof.

12). Concentrated dye wastes and other wastes that are either highly colored or may become highly colored by reacting with other wastes.

13). Any material or substance not specifically mentioned in this section which is in itself corrosive, irritating to human beings and animals, toxic or noxious, or which by interraction with other wastes could produce effects harmful to health and general welfare, including in part deleterious action on the sewage works, adversely affect any treatment process, constitute a hazard to human or animal or have an adverse effect upon the receiving stream.

14). Chlorinated solvents.

'Shall' is mandatory and 'may' is permissive.

'Paunch Manure' The material found in the upper stomachs or paunches of cattle containing feed the animal ate some hours before it was slaughtered plus gastric or digestive excretions within the animal.

'(ppm)' denotes parts per million.

'Surcharge' a charge in addition to Sewer Service Charge for any sewage or industrial wastes other than 'normal' sewage, entering the sewage system.

"51.18.020 Rules and Regulations -- Adoption. With the authorization of the City Council, the City Sanitary Engineer shall make the Rules and Regulations establishing the types and characteristics of sewage, industrial wastes and other matter which shall not be discharged into the City of Omaha Sewerage System, and the types and characteristics of sewage and industrial wastes admissible to the City of Omaha Sewerage System only after pre-treatment; and otherwise governing the discharge of sewage and other matter into the City of Omaha Sewerage System in the interest of the safe and efficient operation of said system. Said Rules and Regulations shall be adopted by resolution by the City Council, City of Omaha, a copy of which shall be on file with the City Clerk, City of Omaha.

"51.18.030 Surcharge - Special Surcharge. There is hereby charged to each lot, parcel of land, building or premises discharging sewage industrial wastes, water or other liquid, other than 'Normal Sewage', either:

1). Into the City of Omaha Sewerage System;

2). Into a stream; or,

3). In a manner contrary to law.

A surcharge established herein, in addition to the charge now or hereafter fixed for 'Normal Sewage'. The basis of the surcharge shall be determined on each of three constituents of the water or wastes:

a). Total suspended solids as herein provided; and

b). B.O.D., five (5) days at 20 degree centigrade where applicable as outlined elsewhere in this section.

c). Recoverable grease and as herein provided.

When anyone or all of the total suspended solids B.O.D., and recoverable grease of a water or wastes accepted for admission to the city sewage works exceeds the values of these constituents for 'normal' sewage, the excess concentration in each case shall be evaluated volumetrically in terms of 'Normal' sewage and be subject to surcharge on the volume derived in accordance with the following:

MISSOURI RIVER PLANT SERVICE AREA.

$$Sv = \frac{(Sw - 3332)}{3332} \times .65 \times F \times 133690$$

$Sv = F\ (\ (Sw - 3332)\ 26.8\ )$ Suspended Solids

B.O.D. shall not be a factor in determining surcharge rates until the Missouri River Plant effluent becomes a factor for consideration by Regulatory Agencies or until it effects inplant operation and efficiency, then limits shall be set and approved by resolution of City Council of the City of Omaha.

$$Sv = \frac{(Gw - 833)}{833} \times .70 \times F \times 133690$$

$Sv = F\ (\ (Gw - 833)\ 112\ )$ Grease

Where Sv is the derived volume of wastes in cubic feet subject to surcharge.

Sw is pounds per million gallons of suspended solids from the wastes as discharged.

3332 - the pounds per million gallons of suspended solids in the 'Normal' Sewage.

Gw - is pounds per million gallons of grease from the wastes as discharged.

833 - the pounds per million gallons of grease in 'Normal' Sewage.

0.65 - factor allowance for 65% degree of purification of suspended solids.

0.70 - factor allowance for 70% degree of purification of grease.

F - the flow expressed in million gallons of the waste discharged.

133,690 - is equal to the factor to convert million gallons to cubic feet.

THE PAPILLION CREEK PLANT SERVICE AREA

$$Sv = \frac{(Sw - 2500)}{2500} \times .90 \times F \times 133690$$

$Sv = F\ (\ (Sw - 2500)\ 48\ )$ Suspended Solids

$$Sv = \frac{(Bw - 2000)}{2000} \times .85 \times F \times 133690$$

$Sv = F \; (\; (Bw - 2000) \; .57 \;)$ B.O.D.
$Sv = (Gw - 833) \times .70 \times F \times 133690$
$Sv = F \; (\; (Gw - 833) \; 112 \;)$ Grease

NOTE:

Where Sv is the derived volume of wastes in cubic feet subject to surcharge.

Sw is pounds per million gallons of suspended solids from the wastes as discharged.

2500 - the pounds per million gallons of suspended solids in the 'Normal' Sewage.

Bw - is pounds per million gallons of B.O.D., in the wastes as discharged.

2000 - the pounds per million gallons of B.O.D., in 'Normal' Sewage.

Gw - is the pounds per million gallons of grease from the wastes as discharged.

833 - the pounds per million gallons of grease in 'Normal' Sewage.

0.90 - factor allowance for 90% degree of purification of suspended solids.

0.85 - factor allowance for 85% degree of purification of B.O.D.

0.70 - factor allowance for 70% degree of purification of grease.

F - the flow expressed in million gallons of the waste discharged.

133,690 - is equal to the factor to convert million gallons to cubic feet.

The equivalent volume of 'normal' sewage as derived from the excess above the normal strength of any water and waste shall be subject to a surcharge for the volume of equivalent 'normal' sewage as computed from the formula for the Missouri River Plant Service Area at a flat rate of $ .0085 for each one hundred cubic feet on the highest single value applicable to the contributing wastes as above computed.

The equivalent volume of 'normal' sewage as derived from the excess above the normal strength of any water and waste shall be subject to a surcharge for the volume of equivalent 'normal' sewage as computed from the formula for the Papillion Creek Plant Service Area at the flat rate of $ .0175 for each one hundred cubic feet on the highest single value applicable to the contributing wastes as above computed.

No statement contained in this Section shall be construed as preventing any special agreement or arrangement between the City of Omaha and any industrial concern whereby an industrial waste of unusual strength of character may be accepted by the City of Omaha for treatment, subject to payment therefore by the industrial concern.

Discharge of wastes from packing industry, in excess of 'Normal' Sewage shall be subject to surcharge rates as stipulated in this Section.

The rate of surcharge in addition to the surcharge for disposal of paunch manure and normal Sewage Service Charge shall be determined on each of the three constituents of the water or wastes:

a). Total suspended solids; and,

b). B. O. D. five (5) day at 20 degree centigrade.

c). Recoverable grease being defined as 70% of the total grease by n-hexane (B.P. 67° - 70° c) extraction and as herein provided.

NOTE: No surcharge shall be charged on the B.O.D. for the the Missouri River Plant Service Area; it being understood that if the B.O.D. in the plant effluent becomes a factor of consideration by Regulatory Agencies or effects inplant operation and efficiency, then new limits shall be established on B.O.D. admissible to the sewer system. Limits so set shall be as recommended by the City Sanitary Engineer and approved by resolution of the City Council, City of Omaha.

The highest volume value in cubic feet of either a), b), or c), times the rate for each 100 cubic feet of water or wastes, shall be the rate of surcharge.

"51.18.040 Unlawful Disposition of Wastes. It shall be unlawful for any person to place, deposit, or permit to be deposited in an unsanitary manner upon public or private property within the City of Omaha or in any area under the jurisdiction of such city, any human or animal excrement, garbage, or other objectionable wastes. It shall be unlawful to discharge into any natural outlet channel within the City of Omaha or in any area under the jurisdiction of such city, any water or wastes containing a toxic or poisonous substance in sufficient quantity to constitute a hazard to humans, animals or fish, or any noxious or malodorous gas or substance constituting a public nuisance.

Storm water and all other unpolluted drainage shall be discharged into such sewers as are specifically designated as combined sewers or storm sewers, or to natural outlets approved by the Chief Plumbing Inspector of Permits and Inspections Division of the Public Safety Department of the City of Omaha. Commercial and Industrial unpolluted cooling water or unpolluted process waters may be discharged upon approval of the City Sanitary Engineer of the City of Omaha to a storm sewer combination or natural outlet.

"51.18.050 Discharge of Water or Waste in Public Sewer. Except as herein provided, no persons shall discharge or cause to be discharged any of the following described waters or wastes to any public sewer in the Papillion Creek Service Area.

1. Any wastes having a five (5) day B.O.D., greater than 240 parts per million (ppm) by weight, or
2. Containing more than 300 parts per million (ppm) by weight of suspended solids, or
3. Any wastes or water having temperature higher than 150° fahrenheit. (65° centigrade).
4. Any water or wastes which may contain more than (100) one-hundred parts per million (ppm) recoverable by weight fat, oil or grease.
5. Any gasoline, benzine, naphtha, fuel, oil, paint, or other *flammable or explosive liquid*, solid or gas.
6. Any garbage that has not been properly shredded.
7. Any ashes, cinders, sand, mud, straw, shavings, metal, glass, rags, feathers, tar, plastic, wood, lubricants, or any other solids, or viscose substance capable of causing obstruction to the flow in sewers or other interference with the proper operation of the sewage works.
8. Any water or wastes having a pH lower than (6.5) or higher than (9.75), or having any other corrosive property capable

of causing damage or hazard to structures, equipment, and personnel of the sewage works.

9. Any waters or wastes, containing a toxic or poisonous substance in sufficient quantity to injure or interfere with any sewage treatment process, constitute a hazard to humans or animals, or create any hazard in the receiving waters of the sewage treatment plant.
10. Blood in sufficient quantities so as to cause discoloration of Papillion Creek Plant effluent.
11. Any waters or wastes containing suspended solids of such character and quantity that unusual attention or expense is required to handle such material at the sewage treatment plant.
12. Gut casings, fleshings, entrails, paunch manure, pen manures, hair and bone.
13. Any noxious or malodorous gas or substance capable of creating a public nuisance. Under no condition will any of the minimums set forth in this chapter be maintained by dilution without the specific permission of the City Sanitary Engineer.

"51.18.055 Discharge of Water or Waste in Public Sewer. Except as herein provided, no persons shall discharge or cause to be discharged any of the following described waters or wastes to any public sewer in the Missouri River Plant Service Area.

1. Any wastes having a five (5) day B.O.D., adversely effecting plant operation and effluent shall be evaluated.
2. Containing more than 400 parts per million (ppm) by weight of suspended solids, or
3. Any wastes or water having temperature higher than 150° fahrenheit. (65° centigrade).
4. Any water or wastes which may contain more than (100) one-hundred parts per million (ppm) recoverable by weight, fat, oil or grease.
5. Any gasoline, benzine, naphtha, fuel oil, paint, or other flammable or explosive liquid, solid or gas.
6. Any garbage that has not been properly shredded.
7. Any ashes, cinders, sand, mud, straw, shavings, metal, glass, rags, feathers, tar, plastic, wood, lubricants, or any other solids, or viscose substance capable of causing obstruction to the flow in sewers or other interference with the proper operation of the sewage works.
8. Any water or wastes having a pH lower than (6.5) or higher than (9.75) or having any other corrosive property capable of causing damage or hazard to structures, equipment, and

personnel of the sewage works.

9. Any waters or wastes, containing a toxic or poisonous substance in sufficient quantity to injure or interfere with any sewage treatment process, constitute a hazard to humans or animals, or create any hazard in the receiving waters of the sewage treatment plant.

10. Blood in sufficient quantities so as to cause discoloration of Missouri River Plant Plant effluent.

11. Any waters or wastes containing suspended solids of such character and quantity that unusual attention or expense is required to handle such material at the sewage treatment plant.

12. Gut casings, fleshings, entrails, paunch manure, pen manures, hair and bone.

13. Any noxious or malodorous gas or substance capable of creating a public nuisance. Under no condition will any of the minimums set forth in this chapter be maintained by dilution without the specific permission of the City Sanitary Engineer.

"51.18.060 Interceptors - When Provided. Grease, oil, and sand separators on interceptors shall be provided when they are necessary in the opinion of the City Sanitary Engineer and with the approval of the Chief Plumbing Inspector of the Permits and Inspections Division of the Public Safety Department of the City of Omaha for the proper handling of liquid wastes containing grease and excessive amounts of any flammable wastes, sand and other harmful ingredients, except that such interceptors shall not be required for private living quarters or dwelling units. All interceptors shall be of a type and capacity approved by the City Sanitary Engineer and the Chief Plumbing Inspector of the Plumbing Section of the Permits and Inspections Division of the City of Omaha and shall be located as to be readily and easily accessible for cleaning and inspection.

"51.18.070 Interceptors - Maintenance. Where installed, all grease, oil and sand interceptors shall be maintained by the owner or persons in possession at his expense in continuous efficient operation at all times.

"51.18.080 Waste Disposition - Requirements. The admission into the public sewers of any waters or wastes.

1). Having a five (5) day B.O.D., greater than the stipulated parts per million (ppm) by weight in Section 51.18.050 and Section 51.18.055.

2). Containing more than the stipulated parts per million (ppm) by weight of suspended solids or item, as set forth in Section 51.18.050 and Section 51.18.055.

3). Containing any quantity or substances having a characteristic described in Section 51.18.010, as herein provided, or

4). Having an average daily flow greater than 2% of the average daily sewage flow of the city.

shall be subject to the review and approval of the City Sanitary Engineer.

Where necessary, the owner shall provide, at his expense, such preliminary treatment as may be necessary to:

a). Reduce the B.O.D. and the suspended solids to limits permitted in various treatment plant service areas.

b). Reduce objectionable characteristics or constituents to within the maximum limits provided for in Section 51.18.110, or control the quantity and rates of discharge of such waters or wastes. Plans, specifications, and any other pertinent information relating to proposed preliminary treatment facilities shall be submitted for the approval of the City Sanitary Engineer and no construction of such facilities shall be commenced until said approval is obtained in writing.

"51.18.090 Preliminary Treatment Facilities - Maintenance. Where preliminary treatment facilities are provided for any waters or wastes, they shall be maintained continuously in satisfactory and effective operation by or in behalf of the owner at his expense and without any expense to the city.

"51.18.100 Manholes - Required - When. Where or when required by the City Sanitary Engineer, the owner of any property served by a building sewer carrying industrial wastes shall install a suitable control manhole in the building sewer to facilitate observation, sampling and measurement of the combined waste, such manhole when required, shall be accessible and safely located, and shall be of standard construction in accordance with plans and specifications of the City of Omaha. The manhole shall be installed by or in behalf of the owner at his expense and without expense to the City, it shall be maintained by him, so as to be safe and accessible at all times.

"51.18.110 Sampling and Measurement. All measurements, tests, and analysis of the characteristics of the water and wastes to which reference is made in Section 51.18.010, as above, shall be determined in accordance with 'Standard Method for Examination of Water and Waste Water, and shall be determined at the control manhole provided for in Section 51.18.100, or upon suitable samples taken at said manhole, at the expense of the City and owner, as outlined in the Rules and Regulations which are a part of this Chapter. In the event that no special manhole has been required, the control manhole shall be considered to be the nearest downstream manhole in the public sewer to the point at which the building sewer is connected.

"51.18.120 Permit Required. No person shall discharge wastes except normal sewage, as defined in this Chapter, from any commercial or industrial establishment into the City sewers without a permit from the Chief Plumbing Inspector of the Plumbing Section of the

Permits and Inspections Division of the City of Omaha, of the Public Safety Department, after approval of application by City Sanitary Engineer. Application to permit the discharge of commercial and industrial wastes into the sewer system shall be filed in writing, upon forms provided, with the City Sanitary Engineer and shall provide at least information including in part: the name, address, telephone number of the applicant; type of products handled or manufactured; the quantity of wastes included, seasonally, weekly, daily or regarding variations; and the chemical, physical and other characteristics of the wastes; all as requested on the forms provided for by the City of Omaha for this purpose; and any other pertinent necessary information. If, after examining the information contained in the application, it is determined by the City Sanitary Engineer that the characteristics of the proposed discharge do conform with the provisions of this Chapter, a permit shall be issued by the Chief Plumbing Inspector of the Plumbing Section of the Permits and Inspections Division of the Public Safety Department of the City of Omaha, allowing the discharge of such wastes into the City Sewer system; but, if after it is determined by the City Sanitary Engineer that the characteristics of the wastes are not in compliance with the provisions of this Chapter, no permit shall be issued. Any such permit may be revoked for cause at any time upon giving the holder thirty (30) days written notice by the Chief Plumbing Inspector of the Permits and Inspections Division of the Public Safety Department of the City of Omaha.

"51.18.130 Inspection Authority. Any duly authorized representative of the City Sanitary Engineer or the Plumbing Section of the Permits and Inspection Division of the Public Safety Department possessing proper credentials and identification shall be permitted to enter all properties at reasonable times for the purpose of inspection, observation, measurement, sampling and testing; in accordance with the provisions of this Chapter.

"51.18.140 Penalties.

1). The owner of any commercial or industrial establishment found to be violating any provisions of this Chapter shall be notified in writing by the Chief Plumbing Inspector of the Permits and Inspections Division of the Public Safety Department, of the City of Omaha, stating the nature of the violation and providing a reasonable time limit for the correction thereof. The owner of such establishment shall permanently cease all violations within the period of time stated in the notice, and shall certify to the City Sanitary Engineer that the corrections have been accomplished.

2). The owner of any commercial or industrial establishment violating any provisions of this Chapter, who shall continue such violation beyond the time limit provided in subsection 1, above, shall be guilty of a misdemeanor, and upon conviction be fined not less than $5.00 nor more than $500.00 or be sentenced to no more than

90 days in jail, or both, for each offense, at the discretion of the court, and every such person, or persons, firm or corporation, shall be deemed guilty of a separate offense for every day on which such violation shall continue.

3). In cases of repeated violation, the City Sanitary Engineer shall request the Chief Plumbing Inspector of the Permits and Inspections Division of the Public Safety Department of the City of Omaha to revoke the permit for the discharge of the wastes into the sewer system.

4). Any person violating any of the provisions of this Chapter shall be liable to the City for any expense, loss and damage incurred as a result of such violation.

"51.18.150 Rates - Changes. The City Council, in order to maintain solvency and equity in the Surcharge Revenue Fund, may raise or lower the sewage surcharge rate, upon recommendation of the City Sanitary Engineer, based upon supporting data and with proper allocation to the various factors involved.

"51.18.160 Surcharge a Lien on Property - Recovery. Where the sewage surcharge established herein is not paid, or the rules or regulations promulgated by the City Sanitary Engineer pursuant to this Chapter, or the provisions of Chapter 51.20 of the Omaha Municipal Code are not complied with, the City of Omaha shall have the right to remove or close sewer connections at the expense of the owner, until payment is made, or the rules and regulations of the City of Omaha are complied with. If the Sewage Surcharge so established is not paid when due, such sum may be recovered by the City in a civil action; or it may be assessed against the premises served, and constitute a lien thereon and be collected in the same manner as other special assessments.

"51.18.170 Surcharge - Date - Applicable. The surcharge for sewage service established herein shall start and be made applicable on all sewer accounts on the date of the adoption of this Chapter, except as otherwise provided herein.

"51.18.180 Appeals. Any person aggrieved by the issuance, denial, suspension, cancellation or revocation of any permit provided for in this Chapter may, within five (5) days of the receipt of written notice of the entry of such order, appeal to the Administrative Appeals Board by complying with the provisions of Chapter 4.08 of the Omaha Municipal Code. Notification of the order of denial, suspension or revocation shall be made in writing and personally delivered or sent by registered mail. Such order shall not become effective until the expiration of the time for appeal. Pending the determination of such appeal, the operation of any order of suspension, cancellation or revocation shall be stayed. The operation of any order denying a permit or the renewal thereof shall likewise be stayed and the applicant for such permit shall be permitted to continue in business pending the determination of such appeal."

"51.18.185 Compliance - Time When. The provisions of Chapter 51.18 of the Omaha Municipal Code shall be complied with on December 15, 1966.

"51.18.190 Severability. If any section, paragraph, clause, phrase, provision, or part of portion of any section, clause or provision of this Chapter, or the application thereof to any person or circumstances held to be invalid or unconstitutional, such invalidity or unconstitutionality shall not affect the validity or application or any other section, paragraph, clause, phrase, provision or part of the portion of this Chapter.

Section 2. This Ordinance shall be in full force and take effect fifteen (15) days from and after the date of its passage.

INTRODUCED BY COUNCILMAN

____

APPROVED BY:

______________________________ ____________
MAYOR OF THE CITY OF OMAHA DATE

PASSED:______________________________

ATTEST:

____

____
CITY CLERK OF THE CITY OF OMAHA

APPROVED AS TO FORM:

____
CITY ATTORNEY

H-1

APPENDIX H

INTERIM UPGRADING TREATMENT MEASURES
FOR
MISSOURI RIVER WASTEWATER TREATMENT PLANT
EXISTING PAPILLION CREEK WASTEWATER TREATMENT PLANT
CENTRAL WASTEWATER PRETREATMENT FACILITY

INTERIM UPGRADING TREATMENT MEASURES

A. INTRODUCTION

The City of Omaha is planning to provide secondary treatment at both the Missouri River and Papillion Creek Wastewater Treatment Plants. The State has required that these facilities be available by 31 December 1975; the source of funds is uncertain, and it is questionable whether this deadline can be met.

In order to prevent the present gross pollution of the Missouri River and its tributaries from continuing until the new plants are constructed (December 1975), it is recommended that interim steps be taken to upgrade treatment levels and reduce pollution.

With this objective in mind, the available data on these two plants were analyzed. The upgrading interim measures that could significantly improve effluent quality are suggested on the following pages. The cost of these measures will be only a small percentage of that to be incurred in providing secondary treatment. In most cases, the upgrading measures taken would be consistent with the overall treatment plans and will still be effective when secondary treatment is provided. The modifications suggested could be in operation within six months of a decision to proceed with a course of action.

Inasmuch as the Central Wastewater Pretreatment Facility provides a significant proportion of the wastewater to the Missouri River WWTP, measures are also suggested that will improve its effluent quality.

It is not the function of the Federal Government to serve as a consultant. The data from this survey were not analyzed in depth, as would be necessary to provide firm recommendations. The analysis did, however, indicate that significant improvements could be made for a relatively modest expenditure of funds. It is recommended that a competent consultant be hired by the City of Omaha to consider these suggestions and other possible interim upgrading techniques.

B. MISSOURI RIVER WASTEWATER TREATMENT PLANT

Analysis of the data available on the Missouri River Wastewater Treatment Plant disclosed that, at 26.1 mgd with three of the eight clarifiers in service, the overflow rate in the primary clarifiers was 769 gpd/ft^2. The average overall BOD removal was about 20 percent, the suspended-solids removal was 26 percent, and only 11 percent of the oil and grease was removed.

Septic conditions in the north influent wastewater caused bubbling and, evidently, flotation in the primary settlers. This probably accounted, in part, for the poor removals. Until this problem is corrected, it is unlikely that any other treatment can significantly improve removals.

The septicity of influent wastewater is a significant problem in many areas of the country. In addition to degrading the effectiveness of treatment, septicity causes corrosion of interceptors and odor problems at the plant. One of the least expensive methods for solving the problem was discussed by Laughlin.* In this case history the problem was solved by the injection of air into a force main that delivered wastewater to the plant. This procedure seems particularly appropriate for the Missouri

---

* James E. Laughlin. *"Studies in Force Main Aeration."* Journal of the Sanitary Engineering Division, American Society of Civil Engineers. December 1964.

River WWTP since air can be injected into the pump discharge at one or more of the lift stations. Although the referenced article discusses a project started in 1962, the technology has not changed appreciably since then.

Air injection could account for significant improvement in the plant effluent quality. It not only would eliminate the naturally occuring undesirable flotation in the primary clarifiers but also could stablize some of the organic material in the force main. Alternate procedures that could control septicity include the use of oxygen instead of air, chemical treatment, or chlorination; however, air injection is simple and straightforward, and is probably the least-cost solution to the problem.

There is no doubt that injection of enough air in the force mains will solve the septicity problem. Further improvement in effluent quality could undoubtedly be obtained by the addition of chemicals before primary sedimentation. Jar tests should be conducted to determine appropriate chemicals and optimum dosages. Adequate mixing would have to be provided.

C. EXISTING PAPILLION CREEK WASTEWATER TREATMENT PLANT

As mentioned previously, the Papillion Creek Wastewater Treatment Plant is grossly overloaded. Even with design flow (18 mgd) passing through the primary clarifiers, the overflow rate would be 3,080 gpd/ft^2. This overloads the clarifiers by a factor of at least two. At a flow of 27.3 mgd the overflow rate is 4,670 gpd/ft^2.

The activated sludge plant, at 13 mgd, has an aeration time of

2.77 hr which is probably not adequate if the conventional plug flow arrangement is used.

The purpose of the "aeration basin" used to treat all primary effluent in excess of 13 mgd is vague. Even if this were converted to an aeration basin in the activated sludge system, the total aeration time would be only 1.76 hr (at 27.3 mgd). This is insufficient time using any modification of the activated sludge process.

The final clarifiers, at a flow of 18 mgd, have an overflow rate of 1,020 gpd/ft^2. At 27.3 mgd the overflow rate is 1,545 gpd/ft^2. With a well-settling activated sludge (long aeration time), the former value may be barely adequate. The latter value would not be adequate under any circumstances. The increase in suspended solids from the influent concentration to that of the effluent is probably caused by the generation of biological solids in the aeration basin that have no change of settling in the final clarifier.

As an interim solution some of the existing tankage could be used to equalize the flow, and other tanks be used to provide primary treatment with an overflow rate of 600 to 800 gpd/ft^2. The addition of chemicals (as determined by jar test) should result in suspended-solids removals in excess of 75 percent and BOD removal of about 50 percent. With the present configuration and load, chemically assisted primary treatment will provide better removals than secondary treatment as now practiced.

D. CENTRAL WASTEWATER PRETREATMENT FACILITY

Analysis of the data on the Central Wastewater Pretreatment Facility disclosed that, at the average maximum flow of 7.5 mgd, the overflow rate in the sedimentation basins is 1,375 gpd/ft^2. The overflow rate in the air flotation unit is 0.65 gpm/ft^2, and the detention time in this unit is 138 minutes. The EPA Design Manual on Suspended Solids Removal recommends an overflow rate of 1-6 gpm/ft^2 and a detection time of 10-40 minutes for the air-flotation process. The long detention time could be causing break-up of the floc and reduction in solids removal.

The facility obtains 60 percent removal of suspended solids, 60 percent of COD, 61 percent of VSS, and 88 percent removal of oil and grease. It is difficult to explain the minus 19 percent BOD removal. Except for BOD, these removal efficiencies represent good performance for a primary plant.

With the information available, a specific course of action to improve removals at this plant can not be made. There are, however, several possible courses of action that could be effective. These are discussed in the following paragraphs:

1. A report* on the meat industry states that both polyelectrolytes and alum improve separation of oil and grease in a flotation unit. Ferric iron can also be effective in this application. In addition to promoting flocculation, these chemicals help in breaking up emulsions. Adequate mixing of the chemicals must be provided
2. A long detention time and slow foam skimmer speed in the flotation unit could both re-enter the water phase and work toward degradation of product quality by allowing the foam to break up.

---

* A. J. Steffen. *Waste Disposal in the Meat Industry*. Water and Wastes Engineering. March and May, 1970.

Small-scale experimentation could determine if either of these factors is limiting removal efficiency.

3. The report by Steffin[*] states that a typical range of grease concentration from a meat-packing plant is 200-1,000 mg/l, as opposed to the range of 120-7,400 mg/l in the raw wastewater entering the Central Wastewater Pretreatment Facility. Improved housekeeping and dry waste recovery (particularly of paunch manure) in the meat-packing plants that contribute wastes would undoubtedly reduce the load to the pretreatment facility and improve effluent quality.
4. Because of the production processes of the waste source, the flow rate varies widely over a 24-hr period. Equalization of the flow rate to reduce the peaks would provide better effluent quality.

Implementation of one or more of the preceding procedures should allow the pretreatment facility to meet the State standards for suspended solids and oil and grease to 400 mg/l and 1,800 lb/day, respectively. The oil-and-grease discharge, however, is equivalent to 288 mg/l in a flow of 7.5 mgd. The roughing filter planned for the Missouri River WWTP (in 1975 or later) will probably reduce this concentration such that the activated sludge plant can meet the standards being set by EPA for secondary treatment. In the meantime, the high levels of oil and grease discharged from the Central Wastewater Pretreatment Facility will likely continue to pollute the Missouri River.

---

[*] A. J. Steffen. Ibid.